DOCUMENT RESUME

ED 474 993 SE 067 597

AUTHOR	Adcock, Deborah P.
TITLE	Math Sense: Measurement and Data Analysis. Teacher's Resource Guide.
ISBN	ISBN-1-56420-386-7
PUB DATE	2003-00-00
NOTE	79p.; For other documents in the Math Sense series, see SE 067 593-604.
AVAILABLE FROM	New Readers Press, 1320 Jamesville Avenue, Syracuse, NY 13210. Web site: www.newreaderspress.com.
PUB TYPE	Books (010) -- Guides - Classroom - Teacher (052)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	*Adult Education; *Data Analysis; Mathematics Activities; Mathematics Instruction; Mathematics Skills; *Measurement; *Teaching Methods; Units of Study

ABSTRACT

This book is a teacher's resource guide designed to help students gain the range of math skills they need to succeed in life, work, and on standardized tests; overcome math anxiety; discover math as interesting and purposeful; and develop good number sense. Topics covered in this book include measurement and data analysis such as measuring distance, space, time, capacity, weight, temperature, organizing and summarizing data, displaying data on a graph, and analyzing data. Lessons are organized around four strands: (1) skill lessons that present instruction and practice in math skills including computation and solving word problems; (2) tools lessons emphasizing the use of objects such as calculators or concepts such as estimation, all within real-life contexts; (3) problem solving lessons designed to strengthen estimation and reasoning skills and help students build strategies for solving single and multi-step problems; and (4) application lessons that provide practice with realistic situations that require mathematics. (Author/KHR)

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Math Sense

Formerly Smart Solutions

Measurement and Data Analysis

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Teacher's Resource Guide

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MATH SENSE

Skills, Problem Solving, Tools, and Applications

TEACHER'S RESOURCE GUIDE

Measurement and Data Analysis

Deborah P. Adcock

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New Readers Press

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Math Sense: Measurement and Data Analysis Teacher's Guide
ISBN 1-56420-386-7

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New Readers Press
Division of ProLiteracy Worldwide
1320 Jamesville Avenue, Syracuse, New York 13210
www.newreaderspress.com

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Printed in the United States of America
9 8 7 6 5 4 3 2 1

All proceeds from the sale of New Readers Press materials support literacy programs in the United States and worldwide.

Developer: Learning Unlimited, Oak Park, IL
Content Editing: Sybil M. Sosin Publishing Services
Series Editor: Judi Lauber
Production Director: Heather Witt
Illustrations: Linda Tiff, James P. Wallace
Cover Design: Kimbrly Koennecke

Casio *fx*-260 image courtesy of Casio, Inc.

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Unit 1

Distance, Space, and Time

Unit Overview

The purpose of this unit is to present students with measurement concepts associated with distance, space, and time. Students will use both English and metric units of measure. Students will become familiar with English and metric rulers. They will do conversions and use formulas.

When Is Measuring Important to Me?

page 13

Have students work individually to complete the checklist at the top of the page and answer questions 1–3. Ask volunteers to describe instances when they had to think about distance, space, or time. Then discuss student responses to questions 1–3. Encourage students to share their responses so they see that there can be a variety of answers to the same question.

Talk About It page 13

Have students work in pairs or in small groups to discuss the ways they keep track of time each day. You may want to have students explore other time concepts by asking, *"How is time on a clock measured? How do you keep track of monthly or yearly responsibilities?"* Be sure students understand that time is measured in many increments, such as minutes, hours, days, weeks, months, and so on.

Working Together page 49

Discuss students' responses to questions 1–5. Encourage students to recognize that there are a variety of responses to each question. Have students work in small groups to create a measurement activity of their own. Each group should exchange its measurement activity with another group. The other group should solve or complete the activity.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
English Units of Length	14	4	Reasoning/Hands-On	
The English Ruler	16	4	Reasoning/Hands-On	1
Metric Units of Length	18	5	Reasoning/Communication	2
The Metric Ruler	20	6	Cooperative Learning	
Adding and Subtracting Lengths	22	6	Hands-On/Cooperative Learning	
Multiplying and Dividing Lengths	24	7	Cooperative Learning	
Mixed Problem Solving	26	7	Reasoning/Cooperative Learning	3
Converting Length	28	7	Reasoning	
Gridding in Answers	30	8	Grid Activity	4
Finding Perimeter	34	8	Reasoning/Hands-On	5
Finding the Area of a Rectangle	36	9	Hands-On/Cooperative Learning	6
Finding Volume	38	10	Hands-On/Cooperative Learning	7
Using Units of Time	40	10	Reasoning	
Working with Time Schedules	42	10	Reasoning/Hands-On	8
Using the Distance Formula	44	11	Hands-On/Cooperative Learning	9
Working with Time Zones	46	11	Reasoning/Cooperative Learning	

English Units of Length

SB p. 14

Lesson Objectives

- become familiar with English units of length
- convert English units to larger or smaller English units

Activity

English Lengths

Purpose: extend the ideas in the lesson

Materials

- yardstick
- 12-inch ruler

What to Do

1. Model how to measure the height of a door in inches and in yards. Ask students, *"Which form of measurement is more appropriate?"* Have students discuss the advantages of using the yardstick, rather than the ruler, to measure the height of the door.

2. Point out dimensions of objects in the classroom, such as the height of a wall, the length of a desktop, and so on. Have students decide the best unit of measurement for each dimension (inches, feet, or yards). Be sure students explain their reasoning.

3. Demonstrate methods for estimating measurements. For example, ask, *"How can you estimate the height of a wall?"* Guide students to see that the height of the wall can be estimated by using their own height. Explain, *"If you know that you are about six feet tall and you estimate the height of the wall to be about three feet taller than you, you can determine that the height of the wall is about nine feet."*

4. Next, demonstrate a method for estimating the length of a wall. Explain that the length of a person's foot can be estimated to be about 12 inches, or 1 foot. So, if it takes about 12 heel-to-toe steps to measure the length of a wall, the estimate of the wall's length would be about 12 feet long.

What to Look For

Be sure that students can identify the appropriate unit of measurement for each object. It is important for students to be able to determine the easiest form of measurement on their own as they work through this unit.

The English Ruler

Tools

SB p. 16

Lesson Objectives

- understand how to read an English ruler and tape measure
- understand fractional units of a ruler

Common Difficulties

Fractional parts and fractions in lowest terms may be difficult concepts for some students. Students who have difficulty with fractions may need help understanding that the fractional parts of an inch shown on student book page 16 ($\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$) represent fractions in lowest terms. Remind students that $\frac{1}{8}$ inch is $\frac{2}{16}$, $\frac{1}{4}$ inch is $\frac{4}{16}$, and $\frac{1}{2}$ inch is $\frac{8}{16}$. The following activity will reinforce these concepts.

Activity

Fractional Parts

Purpose: reinforce the ideas in the lesson

Materials

- PCM 1: Fraction Bars, p. 46
- rulers

What to Do

Distribute a copy of PCM 1 to each student. Explain to students that each fraction bar has 16 equal parts.

Have students shade in $\frac{2}{16}$, $\frac{4}{16}$, $\frac{8}{16}$, and $\frac{5}{16}$. You may want to model this on the blackboard at the same time. Show students how to express these fractions in lowest terms. Point out that $\frac{5}{16}$ is already expressed in lowest terms. Be sure students understand that the fractional parts represent $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{5}{16}$ respectively.

Compare the fraction bars to the measures on a ruler. For example, explain to students that $\frac{8}{16}$ inch = $\frac{1}{2}$ inch. Ask, *"How is this shown on a ruler? How is 'four-sixteenths equals one-fourth' shown on a ruler?"* ($\frac{8}{16}$ is shown by 8 sixteenth-inch marks and $\frac{1}{2}$ is shown by the half-inch mark; $\frac{4}{16}$ is shown by 4 sixteenth-inch marks; and $\frac{1}{4}$ is shown by 1 quarter-inch mark.) Discuss how the length of the marks on a ruler helps you to see a measurement in lowest terms.

Metric Units of Length

SB p. 18

Lesson Objectives

- become familiar with metric units of length
- convert metric units to larger or smaller metric units
- estimate metric conversions

Common Difficulties

Some students may have difficulty understanding the application of metric units. Ask students which of the four metric measures should be used to find the width of the edge of a coin (millimeters), the length of a book (centimeters), the height of a door opening (meters), and the distance between two cities (kilometers). Have students volunteer additional examples for each unit of measure.

Students may be familiar with the metric system but may not be used to performing computations with metric units. A review of decimals, as in the following activity, may help students with this.

Activity

Understanding Decimals

Purpose: understand decimal representation

Materials

- PCM 2: Decimal Place Value, p. 47

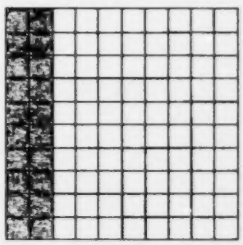
What to Do

1. Distribute several copies of PCM 2 to each student. Remind them that the decimal system is an extension of the whole-number place value system. Each place has a value 10 times greater than the place to its right.

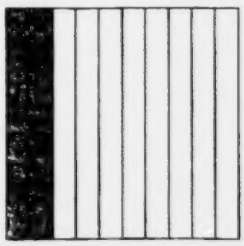
2. Ask students to write the number eight hundredths (0.08) in the correct columns on the chart at the top of PCM 2. Then have students write the number eight tenths (0.8) in the correct columns on the chart. Ask students: *"Which number has a greater value, eight hundredths or eight tenths?"* (8 tenths)

3. To reinforce this concept visually, have students shade the hundredths squares to show eight hundredths. Then have students shade the tenths bars to show eight tenths. Ask students again which number has a greater value.

4. Give students metric values to compare, such as 2 cm (.02 m), 20 cm (.20 m) , and 200 cm (2.0 m). Have students write them on the chart and then use the tenths bars and hundredths squares to demonstrate their answers. For example, to show 2 cm, students should fill in 2 boxes on the hundredths squares; to show 20 cm, students might fill in 2 bars on the tenths bars or 20 boxes on the hundredths squares; to show 200 cm, students might fill in 20 tenths bars or 100 hundredths squares and 10 tenths bars.



20 cm



20 cm

What to Look For

Be sure students can recognize decimal place values and are able to determine which values are larger or smaller than others. Students should also recognize that decimals can show amounts less than 1 or amounts greater than 1.

The Metric Ruler

Tools
SB p. 20

Lesson Objectives

- understand how to read a metric ruler
- understand how to express metric measurements
- understand how to read an English decimal ruler

Common Difficulties

Students sometimes have difficulty expressing metric units in decimals. Emphasize that the metric ruler does not use fractions to express parts of a whole, but instead uses decimals. Reinforce the rationale for this by explaining that the metric system is based on the decimal system.

Activity

Writing Measures

Purpose: extend the ideas in the lesson

Materials

- metric rulers
- various classroom objects no longer than 30 cm

What to Do

Have students work in groups to measure the lengths of three objects by using a metric (centimeter) ruler. Have students write each measurement three ways—in millimeters only, in whole numbers of centimeters and millimeters, and in a decimal number of centimeters. For example, 26 mm can also be written as 2 cm 6 mm or 2.6 cm.

Ask students which form of measurement they feel is most appropriate for each of the objects they measured. Discuss their responses.

What to Look For

Be sure students are comfortable using metric measures of length and choosing an appropriate measure for a given object.

Adding and Subtracting Lengths

SB p. 22

Lesson Objectives

- add and subtract English units of length
- add and subtract metric units of length
- estimate before finding an exact answer

Common Difficulties

Students may have difficulty regrouping English and metric measures. To help them, provide additional examples of problems like those on student book page 23.

Activity

Estimating Measurements

Purpose: estimate measurements

Materials

- English and metric rulers

What to Do

Have students work with a partner to estimate the English and metric lengths of several classroom objects. For example, ask students to estimate the length of a pencil in inches and in centimeters or millimeters. Then have students take actual measurements and compare their estimates with the actual measurements.

Have volunteers report their results. Ask how close their estimates were and what they based their estimates on.

Repeat the activity with larger objects using feet and centimeters.

Multiplying and Dividing Lengths

SB p. 24

Lesson Objectives

- estimate when multiplying and dividing lengths
- multiply and divide lengths to get exact measures

Activity

Simplifying Measurement

Purpose: practice simplifying measurements

What to Do

Have students work in small groups. Ask them to make a list of questions dealing with real-life English and metric measurements that need to be simplified. Some sample questions are: *"How tall are you if you are sixty-six inches tall? How far is one thousand five hundred meters? How many feet long is a football field?"*

Each group should come up with about 12 questions. Have groups exchange their lists and simplify the measurements.

Mixed Problem Solving

SB p. 26

Lesson Objective

- apply addition, subtraction, multiplication, and division skills

Activity

Drawing on Your Skills

Purpose: reinforce the ideas in the lesson

Materials

- PCM 3: Drawing on Your Skills, p. 48

What to Do

Distribute a copy of PCM 3 to each student. Have them write four different word problems based on the art on PCM 3. Students should use each of the four basic operations—addition, subtraction, multiplication, and division—in their problems. They should make sure their problems can be solved.

Have students exchange their problems with a partner. The partner should solve the problems. Students should return the solved problems for their partner to check.

Have volunteers read one of their problems. As a class, discuss which operation to use to solve each problem and why.

Converting Length

Problem Solver

SB p. 28

Lesson Objectives

- convert English measures to metric measures
- convert metric measures to English measures

Activity

Converting Measures

Purpose: reinforce the ideas in the lesson

What to Do

1. Have each student estimate the following measurements:
   - the length of his or her hand from the wrist to the tip of the longest finger, in inches
   - the height of the blackboard, in feet
   - the length of the longest side of the classroom, in yards
   - the distance from home to class, in miles
2. Ask students to name the appropriate metric measure for the four examples. (length of hand, centimeters; height, centimeters or meters; length of the longest side of the classroom, meters; distance from home to class, kilometers)
3. Have students convert their measurements from English to metric.

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Gridding in Answers

Tools

SB p. 30

Lesson Objectives

- fill in measurements on a five-column grid
- write measurements

Activity

Write It Another Way

Purpose: reinforce the ideas in the lesson

Materials

- PCM 4: Five-Column Grids, p. 49
- scientific calculators such as the Casio *fx*-260 (optional)

What to Do

Distribute a copy of PCM 4 to each student. Write the following measurements on the board along with a new unit for each measurement. Explain that students should convert the given measurement to the new unit and grid their answers.

Students may choose to use decimals or fractions. Remind students that a mixed number must be gridded as an improper fraction or a decimal.

Measurement	New Unit	Answer for Grid
1. 3 ft. 9 in.	feet	3.75 or 15/4
2. 5.4 km	meters	5400
3. 12 lb. 4 oz.	pounds	12.25 or 49/4
4. 2.5 lb.	ounces	40
5. 1,600 liters	kiloliters	1.6
6. 10 c.	quarts	2.5 or 5/2
7. 3.2 mi.	feet	16896
8. 2.8 g	milligrams	2800
9. 4 c. 6 fl. oz.	cups	4.75 or 19/4

Using the Casio *fx*-260 for the GED

If you decide to incorporate scientific calculators, students can make use of the functions $a\frac{b}{c}$ and SHIFT $a\frac{b}{c}$ to change fractions to decimals and/or improper fractions. Refer to page 220 in the Tool Kit for more information about these keys.

Finding Perimeter

SB p. 34

Lesson Objectives

- use formulas to find the perimeter of a triangle, square, rectangle, and circle
- understand the relationship between a circle's diameter and circumference
- estimate the value of π (pi)

Common Difficulties

Some students may be uncomfortable working with formulas and variables. Review each formula for finding perimeters and remind students that the word *sum* indicates addition and the word *times* means they must multiply. Explain that a variable is used to express an unknown value. Also, you may want to explain that many variables are symbols that represent words, such as *s* for side, *l* for length, and *w* for width.

Activity

Understanding Formulas

Purpose: extend the ideas in the lesson

Materials

- yardstick or tape measure

What to Do

Have students name objects in the classroom that are squares, rectangles, and triangles. You may have to bring in some triangular objects. List the objects on the board as students name them. Have students write the appropriate formula for finding the perimeter of each object.

When students are comfortable writing the formulas, choose one example of each plane figure. Ask volunteers to take actual measurements of each object using a yardstick or tape measure. Have students use the formula to find the perimeter of each object. Ask volunteers to share their answers for each example.

Activity

Circle Measurement

Purpose: reinforce the ideas in the lesson

Materials

- PCM 5: Circles, p. 50
- rulers
- string

What to Do

1. Have students work in groups. Distribute a copy of PCM 5, a ruler, and a length of string to each group. Have each group use a ruler to measure the diameter of each circle on the handout. They should measure Circles A, B, and C to the nearest $\frac{1}{2}$ inch. They should measure Circles D, E, and F to the nearest centimeter.

2. Have students write and use the circumference formula, $C = \pi d$, to find each circumference. They should write their answers on the lines labeled C_1. The circumference of circles A, B, and C should be expressed in inches; of D, E, and F in centimeters.

3. Have groups exchange work with other groups to check their results. Have students use the string to measure the actual circumferences. They should write these values on the lines labeled C_2.

4. Students should then compare the circumferences found using the formula to those found by measuring with a string.

Activity

Square Units

Purpose: extend the ideas in the lesson

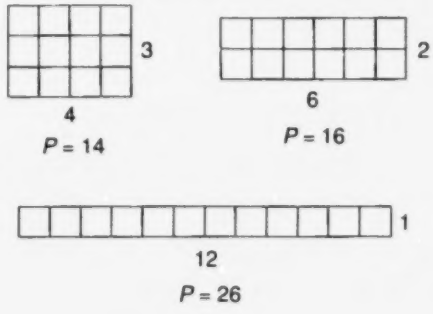
Materials

- PCM 6: Centimeter Squares, p. 51

What to Do

1. Distribute a copy of PCM 6 to each student. Ask them to use the PCM to write an area problem for a partner to solve. Tell students to think of a word problem and to shade in squares on the PCM that will illustrate the problem. Remind them to include a scale for their drawing. The kind of scale needed will depend on the kind of problem written. For example, "A forest fire burned the shaded area. On a scale of 1 square = 1 square mile, how large an area was burned?"

2. Model for students how figures with different perimeters can have the same area. For example, an area of 12 square miles can be shown using a figure with a perimeter of 14 miles, with a perimeter of 16 miles, or with a perimeter of 26 miles.



3. Tell students to be sure that they have determined the solution before they ask a partner to solve their problem. Have students exchange problems with a partner and solve the problem they receive.

Finding the Area of a Rectangle

SB p. 36

Lesson Objectives

- understand area and square units
- use a formula to find the area of a rectangle
- explore unusual units of measure

Finding Volume

SB p. 38

Lesson Objectives

- understand volume and cubic units
- use a formula to find the volume of a rectangular solid

Activity

Cube Volumes

Purpose: extend the ideas in the lesson

Materials

- PCM 7: Cubes, p. 52
- scissors
- tape

What to Do

Distribute a copy of PCM 7, scissors, and tape to each student. Have students cut out the two cube patterns from PCM 7 and fold along the dashed lines to construct two cubes, taping the ends in place.

Organize students into small groups. Have students combine their cubes to build rectangular solids of various lengths, heights, and widths. For each solid figure students create, have them write and solve the volume formula. Remind students that each square on the cubes measures 2 cm long and 2 cm wide.

Using Units of Time

SB p. 40

Lesson Objectives

- understand and write 12-hour and 24-hour clock time
- understand and write calendar time

Activity

Time Scheduling

Purpose: extend the ideas in the lesson

What to Do

1. Have each student make a list of activities he or she performs on a typical weekday.
2. Next to each activity, students should write the time they usually begin the activity and the time they usually complete the activity. Tell students that their lists don't have to be exact or particular in detail.
3. When students have completed their lists of activities and times, ask them to find out how much time they spend on each activity. Ask students to share and compare their lists.

Working with Time Schedules

Application

SB p. 42

Lesson Objectives

- read and use a variety of time schedules
- solve problems using time schedules

Activity

Real-Life Calendars

Purpose: extend the ideas in the lesson

Materials

- PCM 8: Calendar, p. 53

What to Do

1. Ask students how many of them use a calendar to keep track of their activities. Discuss the advantages of recording information on a calendar.
2. Distribute a copy of PCM 8 to each student. Have students fill in next month's dates on the PCM.

3. Ask students to record the times they work, go to school, participate in certain activities, and have scheduled appointments. Have them add any other information they use a calendar to keep track of. Tell them that their calendars do not have to be exact. Have students answer the questions at the bottom of the PCM.

Using the Distance Formula

Problem Solver

SB p. 44

Lesson Objectives

- understand the relationships between time, rate, and distance
- understand and use the distance formula

Common Difficulties

If students have problems, remind them that variables are used to express unknown values. Point out that the distance formula can be applied to any form of travel, such as walking, running, flying, etc.

Activity

Problem Solving

Purpose: extend the ideas in the lesson

Materials

- PCM 9: Time, Distance, and Rate, p. 54
- road maps of your state or region

What to Do

1. Distribute a copy of PCM 9 to each student. Have them use the formulas provided to solve the problems.

2. Have students form small groups. Distribute a map to each group. Have each group choose a destination and the route they would travel to reach that destination. Have them estimate how long the trip would take. Discuss how rate would affect travel time.

3. Ask students to write a problem that can be solved using a form of the distance formula. Then have students exchange papers with a partner and solve their partner's problem.

Working with Time Zones

Application

SB p. 46

Lesson Objectives

- understand time zones and the international date line
- calculate differences in time across time zones

Common Difficulties

You may need to reinforce the concept of time zones with students. Since the international date line is an abstract concept, providing additional problems like those on page 47 of the student book can help their understanding. You may want to have students use a globe to solve these problems.

Activity

Time Zone Math

Purpose: reinforce the ideas in the lesson

Materials

- map on SB p. 46

What to Do

Have students use the map on student book page 46 to write a math problem that involves time zones. Their problem should include at least three different time zones. Have students exchange their problem with a partner to solve. Ask volunteers to present their problems and solutions to the class.

Unit 2

Capacity, Weight, and Temperature

Unit Overview

The purpose of this unit is to present students with the measurement concepts associated with capacity, weight, and temperature. Students will use both English and metric units of measure.

When Do I Measure These Things? page 51

Have students work individually to complete the checklist at the top of the page and answer questions 1–3. Ask volunteers to describe instances when they had to think about capacity or weight, such as when comparing products when shopping. Then discuss student answers to questions 1–3. Encourage students to share their responses so they see that there can be a variety of answers to the same question.

Talk About It page 51

Have students work with a partner or in small groups to discuss the ways temperature affects their everyday activities. Be sure students understand that measurement involves many concepts they encounter every day, such as how heavy something is, how much a container will hold, and how hot or cold something is.

Working Together page 83

Discuss student responses to questions 1–5. Encourage students to share their responses with the class. Guide students to recognize examples of real-life experiences that involve metric and English weights and capacity. Discuss shopping strategies that involve the weight or capacity of a product. Ask students if they compare prices of similar products while considering the products' varying weights and capacities.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
English Units of Capacity	52	13	Communication/Cooperative Learning	
English Cups and Spoons	55	13	Reasoning/Hands-On	
Metric Units of Capacity	56	14	Hands-On/Cooperative Learning	
Metric Cups and Spoons	58	14	Reasoning/Hands-On	
Metric Containers	59	15	Reasoning/Cooperative Learning	
Working with Capacity	60	15	Reasoning/Cooperative Learning	
On the Job	62	15	Reasoning/Cooperative Learning	
English Units of Weight	66	16	Reasoning/Cooperative Learning	
English Weight Scale	69	16	Hands-On/Cooperative Learning	10
Metric Units of Weight	70	17	Reasoning/Cooperative Learning	
Metric Weight Scale	73	17	Reasoning/Cooperative Learning	11
Working with Weight	74	18	Reasoning	
Volume, Capacity, and Weight	76	18	Reasoning/Cooperative Learning	
Measuring Temperature	78	19	Reasoning	12
Gridding in Measurement Answers	80	19	Grid Activity	4

English Units of Capacity

SB p. 52

Lesson Objectives

- understand the meaning of capacity and how it is measured
- understand English units of capacity
- convert English units to larger or smaller English units
- estimate before finding an exact answer

Activity

Capacity Patterns

Purpose: identify patterns in English units of capacity

What to Do

Have students work in pairs. Tell them to list the number of cups found in 1 pint, 1 quart, 1 half-gallon, and 1 gallon. Then discuss these questions: *"What pattern do you notice? How can you find the number of cups in three quarts without counting? Three pints? One and one-half gallons?"* (The number of cups in 1 pint, 1 quart, 1 half-gallon, and 1 gallon double in size from one measure to another. This pattern can be used to find other amounts:

3 qt. = 3 × 4 c. = 12 c.
3 pt. = 3 × 2 c. = 6 c.
$1\frac{1}{2}$ gal. = 16 c. + 8 c. = 24 c.)

Ask student pairs to list and discuss everyday items that are usually sold in pints, quarts, half-gallons, or gallons. Ask volunteers to share their lists with the class so students can see a variety of responses.

English Cups and Spoons

Tools

SB p. 55

Lesson Objectives

- understand the relationships between fluid ounces, cups, teaspoons, and tablespoons
- become familiar with measurement tools

Common Difficulties

Some students may need help understanding the two scales on the 1-cup measure shown on student book page 55. Remind students that the scale on the right shows the fractional parts of a cup, while the scale on the left shows the number of fluid ounces the cup contains.

Activity

English Measuring Tools

Purpose: reinforce the ideas in the lesson

Materials

- clear 1-cup measuring cups with both fractional and fluid ounce scales
- tablespoons and teaspoons
- containers of water

What to Do

1. Have students work in small groups. Each group should have a measuring cup, a tablespoon, a teaspoon, and a container of water. Ask students to use a teaspoon to fill a tablespoon with water. Ask, *"How many teaspoons are in one tablespoon?"* (3 tsp.)

2. Next, have students use a tablespoon to fill the cup container with 1 fluid ounce of water. Ask, *"How many tablespoons are in one fluid ounce?"* (2 tbsp.) *"How many tablespoons are in two fluid ounces?"* (4 tbsp.) *"How do you know?"* (By doubling the number of tablespoons found in 1 fluid ounce, you can determine the number in 2 fluid ounces.) *"How can you find the number of tablespoons in four fluid ounces, or one-half cup? In five fluid ounces?"* (Multiply 2 tablespoons by 4 fluid ounces to get 8 tablespoons, and by 5 fluid ounces to get 10 tablespoons.)

3. Provide students with additional amounts to measure if necessary.

Metric Units of Capacity

SB p. 56

Lesson Objectives

- understand metric units of capacity
- convert metric units to larger or smaller metric units
- estimate capacities

Activity

Hands-on Metric Measurement

Purpose: reinforce the ideas in the lesson

Materials

- clear 1-liter container filled with water
- clear 1-quart container
- clear 1-cup English measuring cup with both fractional and fluid ounce scales

What to Do

Ask a volunteer to demonstrate the following activities while the other students observe.

1. Carefully pour as much water as possible from the 1-liter container into the 1-quart container. Pour the remaining water into the 1-cup container.
2. Ask the volunteer to tell the rest of the class how much water is now in the English measuring tools. (1 quart plus $\frac{1}{4}$ cup)
3. Ask students to convert this amount to cups. ($4\frac{1}{4}$ cups)
4. Ask another volunteer to pour 1 cup at a time into the 1-liter container while the other students count the number of cups. This should verify their finding from step 3.

Expansion/Reinforcement: Have students work in pairs or small groups to list as many products or items as they can think of that are measured in metric units of capacity.

Metric Cups and Spoons

Tools

SB p. 58

Lesson Objective

- become familiar with metric measurement tools

Activity

Metric Measuring Tools

Purpose: reinforce the ideas in the lesson

Materials

- clear 1-cup measuring cup showing English and metric units of measure
- a full 12-fluid-ounce can of soda

What to Do

1. Without showing the label of the soda can, have students guess how many fluid ounces and how many milliliters the can holds.
2. Ask a volunteer to empty the can's contents into the measuring cup. The student will have to stop at 8 fluid ounces. Have students determine how many milliliters this equals. (a little less than 250 ml)
3. Based on the knowledge that there is more liquid left in the can, have students readjust their guesses if they want. Now show students the fluid ounce label on the can. Ask, *"How many fluid ounces are left in the can? About how many milliliters are left?"* (4 fl. oz.; a little less than 125 ml)
4. Have students discuss how many cups are in 1 quart (4) and how many metric cups are in 1 liter (4). Ask, *"Which holds more: a one-quart container or a one-liter container? Why?"* (A liter holds slightly more; 250 ml is slightly more than 8 fl. oz.)

Metric Containers

Problem Solver

SB p. 59

Lesson Objectives

- understand the relationship between metric and English units of capacity
- convert English units of capacity to milliliters and liters

Activity

Measurement Strategies

Purpose: extend the ideas in the lesson

What to Do

1. Write the following recipe for punch on the blackboard, or ask students to write the recipe as you dictate:

   $\frac{1}{2}$ liter cranberry juice

   $1\frac{1}{2}$ liters apple juice

   2 liters pineapple juice

   1 liter sparkling water

2. Tell students that they need to make the recipe. They must measure the ingredients with a container that holds 500 milliliters.

3. Have students work in groups to convert the recipe into milliliters so that it can be followed using a measure with a 500-milliliter capacity. (The recipe would read: 500 ml cranberry juice, 1,500 ml apple juice, 2,000 ml pineapple juice, and 1,000 ml sparkling water.)

4. Then have students find English amounts they could use to make approximately the same amount of punch. (2 c. cranberry juice, $1\frac{1}{2}$ qt. apple juice, 2 qt. pineapple juice, and 1 qt. sparkling water)

Working with Capacity

SB p. 60

Lesson Objectives

- add and subtract English capacity units
- add and subtract metric capacity units

Common Difficulties

Students may need to review equivalent English units and simplifying English units of measure. If students need further practice simplifying units, provide additional examples like the problems in part A on student book page 60.

Activity

Simplifying Measures

Purpose: reinforce the ideas in the lesson

What to Do

Have students work in pairs. Ask students to think of three real-life situations where they would combine amounts and then simplify the total amount. Have each pair write three questions, one for each situation. Give them this example: *"A recipe might call for five cups of orange juice plus three cups of pineapple juice for a total of eight cups. What size container would hold the total amount?"* (A half-gallon container)

Tell them to write the answers for each situation on a separate sheet of paper. Have pairs exchange the questions they wrote with other student pairs, who should find answers and simplify. Then have them check each other's work.

On the Job

Application

SB p. 62

Lesson Objectives

- become familiar with various metric containers
- compare English and metric measurement systems

Activity

Understanding Capacity

Purpose: reinforce measurement concepts

What to Do

Tell students to write two math problems. One problem should use English capacity measures, and the other problem should use metric capacity measures. Give them these examples: *"A beaker holds two hundred fifty milliliters. If a laboratory technician needs seven hundred fifty milliliters of liquid, how many times will she need to fill the beaker?"* (3 times) *"A chef needs two and one-half gallons of broth. She already has eight quarts. How many more quarts does she need?"* (2 quarts) Students should write the solution for each problem on another piece of paper.

Have students exchange problems with another student and solve each other's problems. Then have students check one another's work.

What to Look For

If students seem to have difficulty working with either English or metric measurements, or both, you may want to give them other problems similar to those on student book pages 60 and 61.

English Units of Weight

SB p. 66

Lesson Objectives

- understand English units of weight
- convert English units of weight to larger and smaller English units

Common Difficulties

Some students may have difficulty distinguishing between objects measured in ounces and objects measured in pounds. They may need some visual reinforcement to understand the relationship between ounces and pounds. Point out several objects in the classroom, such as a desk, a cup, a student, an eraser, and so on. Ask students to tell whether each item would be measured in ounces or in pounds. Have volunteers name objects that would be measured in tons.

Activity

Converting Weight Units

Purpose: reinforce the ideas in the lesson

What to Do

Have students work in pairs to list five examples of English weight units that need to be converted, such as 160 oz. (10 lb.) or 3,000 lb. ($1\frac{1}{2}$ tons). You may want students to estimate the weight of objects, such as a car, a dog, or a computer. Tell students to state the weights in units that need to be converted.

Have students exchange their examples with other student pairs, who should convert the weights. Discuss their responses as a group.

English Weight Scale

Tools

SB p. 69

Lesson Objective

- read a pound scale

Activity

Real-Life Measuring

Purpose: reinforce the ideas in the lesson

Materials

- PCM 10: English Scale, p. 55
- English weight scale that reads in both pounds and ounces
- several objects of different weights

What to Do

1. Have students work in pairs. Distribute a copy of PCM 10 to each pair. Have each pair mark four points on the English scale and label them *A*, *B*, *C*, and *D*. Tell them to choose points that show pounds and ounces.

2. Have the pairs exchange their scales with other student pairs. Students should read the scale and determine the measurement at each point. They should write the measurements on the lines provided. Then have students check each other's work.

3. Now have students take turns weighing objects on the real scale. Make sure all students have a turn. For the first few, read the weight measurement aloud, reviewing which lines represent pounds and which lines represent ounces. Then have volunteers read aloud the weight measurements of a few more objects.

4. When students have had practice weighing several items, have them take turns estimating the weight of other objects and then finding the exact weight. Discuss what they based their estimates on.

Metric Units of Weight

SB p. 70

Lesson Objectives

- understand metric units of weight
- convert metric units of weight to larger and smaller metric units

Common Difficulties

Some students may have difficulty distinguishing between objects measured in grams and objects measured in kilograms. Point out several objects in the classroom, such as a pencil, a chair, a student, a cup, and a book. Ask students to tell whether each item would be measured in grams or kilograms. Remind students to look, when shopping, for product labels that list metric measurements as well as English measurements. This will help them understand how English units compare to metric units.

Activity

Converting Metric Measures

Purpose: reinforce the ideas in the lesson

What to Do

1. Discuss real-life situations in which students might need to convert to smaller units. As an example, say, *"A football team will receive a discount on bottled water if they order at least sixty liters for each game. If each of the forty players needs an average of seven hundred fifty milliliters per game, how many liters will the team need per game?"* (40 players × 750 ml = 30,000 ml; 30,000 ÷ 1,000 = 30 liters) *"If the players need thirty liters per game, will they order at least sixty liters?"* (no, since 30 is only half of 60)

2. Have students work in pairs. Have them list five examples of metric weight units that can be converted to larger units, such as 1,060 g = ____ kg ____ g. Have student pairs exchange examples and solve. (1,060 g = 1 kg 60 g)

3. Repeat the activity using metric weight units that can be converted to smaller units, such as 1.1 t = _____ kg. Have student pairs exchange examples and solve. (1.1 t = 1,100 kg)

What to Look For

Make sure students are comfortable converting between milligrams, grams, kilograms, and metric tons. Encourage them to practice moving the decimal point three places to the left to divide by 1,000 and three places to the right to multiply by 1,000. Stress the importance of place value in these operations.

Metric Weight Scale

Tools

SB p. 73

Lesson Objective

- read a metric scale

Activity

Metric Weighing

Purpose: reinforce the ideas in the lesson

Materials

- PCM 11: Kilogram Scale, p. 55

What to Do

1. Distribute a copy of PCM 11 to each student. Have students mark four points on the kilogram scale and label them points *A*, *B*, *C*, and *D*. Tell students to choose points that show kilograms and grams.

2. Have students exchange scales with other students. Students should read each other's scales and determine the measurement of each point. They should write the measurements on the lines provided. Then have students check each other's work.

3. Have students find the difference in weight between specific points on the scale. For example, ask students to find the difference between point A and point C on their scales. Ask volunteers to share their answers with the class, using their kilogram scales to explain how they arrived at their answers.

Working with Weight

SB p. 74

Lesson Objectives

- add and subtract English weight units
- add and subtract metric weight units
- estimate before finding an exact answer

Common Difficulties

Make sure students understand the importance of place value when changing from a decimal form to a combination of metric weight units. For example, when changing 6.5 g to a combination of grams and milligrams, placeholder zeros must be added. 6.5 g = 6.500 g = 6 g 500 mg (not 6 g 5 mg).

Activity

Estimating Weight

Purpose: reinforce the ideas in the lesson

What to Do

1. Have students list five English measures in pounds and ounces (such as 8 lb. 5 oz.) and five metric measures in kilograms and grams (such as 4 kg 300 g). Measures should be simplified.

2. Review possible estimation strategies with students. Discuss why 8 lb. 5 oz. could be estimated as 8 lb. and 4 kg 300 g as 4 kg.

3. Have each student exchange papers with another student and write an estimate of each weight listed in step 1. Discuss student responses.

Volume, Capacity, and Weight

Application

SB p. 76

Lesson Objective

- understand the relationships between volume, capacity, and weight

Common Difficulties

Students may need some review of the differences between volume, capacity, and weight before they can understand the similarities shown in the illustrations on student book page 76.

Activity

Relating Measures

Purpose: reinforce the ideas in the lesson

What to Do

1. Have students work in small groups. Tell them they can use student book page 76 as a reference.

2. Ask students to assign approximate weights to English units of capacity based on the knowledge that 1 liter weighs 1 kilogram (about 2.2 pounds) and 1 liter ≈ 1 quart. Some examples include:

   1 c. weighs about 8 oz.

   1 pt. weighs about 1 lb.

   1 qt. weighs about 2 lb.

   $\frac{1}{2}$ gal. weighs about 4 lb.

   1 gal. weighs about 8 lb.

3. Have students research the amount of liquid found in various containers. You can start them off with the following examples: a 12-fl. oz. soda can ($\frac{3}{4}$ lb.), a pint of cream (1 lb.), a 1-qt. bottle of detergent (2 lb.), a $\frac{1}{2}$-gal. bottle of bleach (4 lb.), and a 1-gallon bottle of water (8 lb.)

4. Students should then approximate the weight of the liquid in each full container. Have students compare and discuss their answers. (Approximate weights are given in step 3.)

Measuring Temperature

SB p. 78

Lesson Objective

- read Fahrenheit and Celsius thermometers

Activity

Real-Life Temperatures

Purpose: extend the ideas in the lesson

Materials

- PCM 12: Thermometers, p. 56

What to Do

1. Distribute a copy of PCM 12 to each student. Have students choose and label one Fahrenheit temperature and one Celsius temperature on each weather thermometer on the PCM.
2. Have students exchange their PCMs with other students and then calculate the difference in degrees between the Fahrenheit temperatures on the two thermometers and the Celsius temperatures on the two thermometers.
3. Have students write word problems about each set of temperatures they have labeled. For example, a student has marked 28°F and 45°F. An appropriate word problem would be: "The temperature dropped from 45° to 28°F. By how many degrees did the temperature drop?" (17°) or "The temperature rose from 28° to 45° in three hours. By how much did the temperature rise?" (17°) Have volunteers share their word problems with the class.
4. Next, have students label the normal human body temperature on each clinical thermometer.
5. Then have students find and label a point 2.6°F above normal on the Fahrenheit scale and 1.7°C above normal on the Celsius scale. Have students read these new points (101.2°F and 38.7°C).
6. Students can then use the clinical thermometers to write a word problem about each set of temperatures. Have volunteers share their word problems with the class.

Gridding in Measurement Answers

Tools

SB p. 80

Lesson Objectives

- multiply measurements
- fill in measurements on a five-column grid

Activity

Fraction or Decimal?

Purpose: reinforce the ideas in the lesson

Materials

- PCM 4: Five-Column Grids, p. 49
- six-sided dice (one die per pair of students)
- scientific calculators such as the Casio *fx*-260 (optional)

What to Do

Have students work in pairs. Distribute a copy of PCM 4 to each student. Have one student suggest a measurement, for example, 4 ft. 8 in. Then have the other student roll the die. (For this activity, a roll of 1 will be considered a 10.) Working separately, the students should multiply the measurement by the number rolled and express the product in terms of the larger unit of measure (in this case, feet). Have each student record the answer on a grid. Students should then compare their answers to check their work.

Have students continue until they have filled in all of the grids. Discuss, *"When is it best to use fractions to express measurements? When is it best to use decimals?"*

What to Look For

Students will need to choose the best fractional system for fitting the answer in the grid. If students have not learned the common measurement equivalencies, allow them to refer to page 223 in the Tool Kit.

22

Unit 3

Organizing and Summarizing Data

Unit Overview

The purpose of this unit is to present students with the ways data can be sorted and organized. Students will learn how to interpret and compare data, how to organize data according to specific objectives, how to find typical values, and how to sort data using tables and spreadsheets.

When Is Data Important to Me? page 85

Have students work individually to complete the checklist at the top of the page and answer questions 1–3. Ask volunteers to describe instances when they had to think about, organize, or compare various kinds of information. Perhaps some students recently purchased a large appliance or a vehicle. Did they compare prices or equipment options before they made their purchase? Then discuss student responses to questions 1–3. Encourage students to share their responses so they see that there can be a variety of answers to the same question.

Talk About It page 85

Have students work with a partner or in small groups to discuss typical values. For example, ask, *"What is the typical cost of a meal at a fast-food restaurant or the typical length of a wait at the supermarket?"* Have students think about situations in which an exact value is needed. Be sure students understand that data interpretation occurs in many everyday activities. Point out that many of the measurement activities discussed in unit 2 involve data interpretation from which people often make decisions.

Working Together page 115

Discuss student responses to the activities. Encourage students to share the results of their surveys. Did the students use tally marks to record the responses? Were student results similar or very different? Was the data interpreted in different ways by different students? What conclusions can be drawn from their results?

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
How Is Data Used?	86	22	Communication	
Writing a Data Summary	88	22	Reasoning/Cooperative Learning	
Using a Tally Sheet	90	22	Communication/Hands-On	13
Displaying Data on a Line Plot	92	23	Reasoning/Hands-On	14
Comparing Sets of Data	94	23	Reasoning	
Sorting a List of Data	96	24	Reasoning/Cooperative Learning	15
Finding the Mean	100	25	Hands-On/Cooperative Learning	15
Finding the Median and the Mode	102	25	Hands-On/Cooperative Learning	16
Choosing a Typical Value	104	25	Hands-On/Cooperative Learning	
Reading a Table	106	26	Reasoning	17
Sorting Data in a Table	108	26	Communication	17, 18
Completing a Table	109	27	Hands-On/Cooperative Learning	18
Computer Spreadsheets	110	27	Reasoning/Cooperative Learning	18
Gridding in Mean, Median, and Mode	112	28	Grid Activity	4

How Is Data Used?

SB p. 86

Lesson Objectives

- understand that data can be used in a variety of ways
- recognize real-life situations in which data is used

Activity

Organizing Strategies

Purpose: extend the ideas in the lesson

Materials

- several magazines and newspapers

What to Do

1. Review the four examples of data collection on student book page 86: data used to make informed decisions, to determine public opinion, to provide helpful information, and to support specific points of view and interests.
2. Ask pairs of students to look through newspapers and magazines to find samples of data that fit into the four categories. Tell students to try to find at least one example for each category.
3. Have volunteers share their findings with the rest of the class. Ask them to explain their reasons for placing each sample into the category that was chosen.

Writing a Data Summary

SB p. 88

Lesson Objectives

- understand how categories are used to organize data
- interpret a data summary
- write a data summary

Activity

Data Facts

Purpose: extend the ideas in the lesson

What to Do

1. Have students work in pairs to analyze the Supermarket Data Summary on student book page 88.
2. Ask the pairs to list three different facts that can be determined by studying the data summary: for example, most shoppers surveyed shopped at Valley Foods five or more times a month.
3. Have students share their facts with the rest of the class. Point out the number of different facts students came up with.
4. Discuss how supermarket owners could use facts such as these to benefit the store.

Expansion/Reinforcement: Have students repeat the Data Facts activity using the Television Data Summary on student book page 89.

Using a Tally Sheet

Tools

SB p. 90

Lesson Objectives

- summarize survey data from a tally sheet
- record survey data using tally marks

Activity

Taking Tallies

Purpose: extend the ideas in the lesson

Materials

- PCM 13: Tally Sheet, p. 57

What to Do

1. Distribute a copy of PCM 13 to each student. Have students create a survey question that can be answered with *yes*, *no*, or *undecided*. The question can be about a topic of interest to the students. Students should write their question at the top of PCM 13.

2. Next, have students survey at least five classmates and tally their responses. Be sure students keep track of whom they survey.

3. When the survey process is complete, have students make a final tally of their responses and a data summary of the data they have collected. Then have them write one fact that can be determined from their data summary.

4. Have students exchange their data summaries with a partner. Have each student write an additional fact about their partner's findings.

5. Ask volunteers to share their data summaries and facts with the class.

Displaying Data on a Line Plot

SB p. 92

Lesson Objectives

- understand how data is organized using a line plot
- interpret data from a line plot
- draw a line plot

Common Difficulties

Some students may have difficulty understanding how the information in a list can translate to the symbols on a line plot. Be sure students understand what each component of the line plot represents, including the range of values, each specific value, and all labels and titles. It may be helpful to explain to students how the data from the table on student book page 92 was used to construct the line plot. For example, you might explain that since the price for a home at 1254 Hayes is $89,500, an *X* is placed above the label *$85,000–$90,000* because $89,500 falls between $85,000 and $90,000.

Activity

Plotting Data

Purpose: reinforce the ideas in the lesson

Materials

- PCM 14: Line Plots, p. 58
- classified ad sections from several newspapers

What to Do

1. Have students work in groups. Distribute a copy of PCM 14 and classified ad sections to each group. Ask each group to decide on a type of data to survey from the classified ads. For example, they might look for monthly rents for two-bedroom apartments, costs of three-bedroom homes, or salary ranges for similar jobs. Have them look through the ads and list the data for 10 or 15 samples.

2. Have students determine the range of values for their data and decide on titles for their line plots.

3. Have students plot their data on PCM 14.

4. When students have finished their line plots, have them write a sentence that summarizes the information they have organized. Then have each group share the results of their survey and their summaries.

Comparing Sets of Data

Problem Solver

SB p. 94

Lesson Objective

- use percents to summarize and compare two or more sets of data

Common Difficulties

Some students may need to review percents. Give them some practice in percent operations, such as finding the percent of a number (15% of 40 is 6) and expressing fractions as percents ($\frac{5}{10} = 50\%$).

When comparing data, some students have difficulty understanding which data represents the percent, the part, and the whole. Review this using the example on student book page 94. Explain that the part (120 employees voting yes) and the whole (200 employees) are given. The problem asks to find the percent. ($\frac{\text{120 employees voting yes}}{\text{200 employees}} = 60\%$)

Activity

Finding Percents

Purpose: reinforce the ideas in the lesson

What to Do

1. Review different methods for finding percent. The following example shows a simple method for changing a fraction to a percent. The fraction equals $\frac{\text{part}}{\text{whole}}$. Multiply the fraction by $\frac{100\%}{1}$ to change the amount to a percent. For example, if 3 is the part and 4 is the whole, what percent is 3 out of 4?

$$\frac{3}{4} \times \frac{25\ 100\%}{1} = 75\%$$

2. Another method is to divide the part by the whole and then change the decimal amount to a percent. For example, 3 out of 4 is what percent?

$$\frac{3}{4} = 4\overline{)3} = .75 = 75\%$$

Students could also use a calculator to find the percent. They would enter [3] [÷] [4] [=] in their calculator. The result would be a decimal amount of .75. Convert the decimal to a percent: .75 = 75%. Refer students to student book pages 220 through 222 in the Tool Kit for further calculator instruction.

3. Another method uses proportion to find the percent. Students can use a percent box to set up the proportion as in the following example.

P	%
W	100

$\frac{3}{4} = \frac{\%}{100}$

$300 \div 4 = 75 \longrightarrow 75\%$

Find the cross product with the two known numbers. Divide by the remaining number. Add the percent sign to the answer.

4. Have students work alone or in pairs. Ask students to write two questions that can be answered using the data from the line plots on student book page 95. Questions should require answers to be expressed as percents. Give this example: *"What percent of students in Mr. Johnson's class completed eleven to twelve years of school?"* Make sure students' questions compare the part to the whole. Then have them exchange their questions with others students to solve.

Sorting a List of Data

SB p. 96

Lesson Objectives

- understand various methods of sorting data
- sort data alphabetically, numerically, or chronologically

Activity

Sorting Strategies

Purpose: reinforce the ideas in the lesson

Materials

- PCM 15: Organizing Data 1, p. 59

What to Do

Have students work in groups of at least three but no more than five. Distribute a copy of PCM 15 to each student.

Students should first decide what data they want to gather and sort. They need two kinds of data, such as last names and heights of group members, or first names and shoe sizes of group members. Have them gather the data and list it in the *Information* column.

Students should then fill in the next two columns to show two different ways they can sort their data. Examples might be *Sorted by Last Name* and *Sorted by Height*.

Ask volunteers to share their results with the class.

Finding the Mean

SB p. 100

Lesson Objectives

- understand typical values
- find the mean of a set of data
- recognize nontypical values

Activity

Real-Life Averages

Purpose: reinforce the ideas in the lesson

Materials

- PCM 15: Organizing Data 1, p. 59

What to Do

If possible, have students work in groups of at least five. Distribute a copy of PCM 15 to each group. Have each group member state his or her height in inches. Have students record their data on PCM 15.

Ask students to list the different ways the data in their tables could be organized (by height from greatest to least or least to greatest, or in alphabetical order). Have them organize their data in one of these three ways on PCM 15.

Ask students to study their data. Tell them to determine the mean height of the group. Have students write a summary of their data explaining whether or not the mean height represents a good typical value for the group and why.

Finding the Median and the Mode

SB p. 102

Lesson Objective

- organize a set of data to find the median and the mode

Activity

Finding Medians

Purpose: reinforce the ideas in the lesson

Materials

- PCM 16: Number Cards, p. 60

What to Do

1. Have students work in groups. Distribute a copy of PCM 16 to each group. Have students cut out the number cards.
2. Have students shuffle the cards and place the deck facedown. Each group should draw the first five cards and place them faceup in a row. Tell students to find the median value of the set of numbers.
3. Tell students to reshuffle all of the cards and place them facedown again. Now they should draw the first six cards and place them faceup in a row. Have students find the median value of the set of six numbers.
4. If students have difficulty finding the median with an even number of cards, repeat step 3. Remind students that the median of an even set of numbers is the average of the two middle values.
5. As a class, discuss the difference between using five cards and six cards. Ask students to explain why no set of numbers from the cards will have a mode. (No two number cards are alike.)

Expansion/Reinforcement: In addition to finding the median in steps 2 and 3, have students find the mean of each set of numbers. Discuss which value is more typical of the numbers in each set and why.

Choosing a Typical Value

Application

SB p. 104

Lesson Objective

- determine the kind of typical value needed in a situation

Activity

Real-Life Typical Values

Purpose: reinforce the ideas in the lesson

What to Do

Ask students to name the typical value (mean, median, or mode) they would need for each of the following situations:

- *"You want to find an average of your test scores."* (mean)
- *"You need to know the most common price for a quart of milk at stores in your area."* (mode)
- *"You're interested in a store's middle price for nineteen-inch TV sets."* (median)

As a group, have students suggest five or more values for each of the situations listed above. Students should then find the typical value that they need for each situation (mean, median, or mode).

Discuss the following question with students: *"What other factors influence the typical value of a set of numbers?"* (extreme values, the frequency with which values occur, the number of values in the group, and the intended purpose/use of the typical value). For example, a bowling average is based on all of a bowler's scores, and one poor game could greatly affect a three-game average.

Reading a Table

SB p. 106

Lesson Objectives

- become familiar with the parts of a table
- understand how data is classified in a table
- interpret the data in a table

Activity

Reading a Table

Purpose: reinforce the ideas in the lesson

Materials

- PCM 17: Nutrition Table, p. 61

What to Do

1. Have students work in pairs. Distribute a copy of PCM 17 to each pair. Give students time to study the information in the table.
2. Ask students to answer the questions on the PCM. Tell them to pay close attention to serving sizes.
3. Next, have each pair write three questions that can be answered by comparing the information in the table. Have pairs exchange questions and answer them.
4. Have a volunteer from each pair discuss the questions they wrote and the answers they gave to the questions they received.

Note: Students should save PCM 17 for use in the next lesson's activity.

Sorting Data in a Table

Application

SB p. 108

Lesson Objectives

- understand that data in a table can be sorted in various ways
- sort data in a table

Activity

Sorting Information

Purpose: reinforce the ideas in the lesson

Materials

- PCM 17: Nutrition Table, p. 61
- PCM 18: Tables, p. 62

What to Do

Have students work in pairs. Distribute a copy of PCM 17 to each pair, or have them use their copy from the previous activity. Have students list three other ways the information in the table could be sorted besides by calories. (Some options are alphabetically or by total fat, cholesterol, sodium, or protein. Sorting by protein would result in the original order.) Ask students why someone might want to sort the table by the other ways they listed. Discuss all responses.

Distribute a copy of PCM 18 to each pair. Have students sort the data from the table on PCM 17 in a different way on PCM 18. Ask volunteers to describe

how their information is sorted and their reasons for presenting the data this way.

What to Look For

Be sure that students recognize that data can be sorted in a variety of ways and that how data is sorted depends on the objective of the sorting.

Completing a Table

Problem Solver

SB p. 109

Lesson Objectives

- sort data to create a table
- answer questions based on a table

Activity

Making a Table

Purpose: extend the ideas in the lesson

Materials

- PCM 18: Tables, p. 62

What to Do

1. Have students work in groups. Distribute a copy of PCM 18 to each group. Have them use it to create a table of their own. Students should discuss the data they want to display in their tables. They might display information about each group member, such as name, height, hair color, month of birth, and favorite color. Or they can make up data similar to the examples in the student book.

2. Students should write their headings in the box at the top of each column. Explain that their tables can contain any kind of data they choose. They do not have to fill up every column and row of the table. Be prepared to answer any questions the students may have as they prepare their tables.

3. When students are finished, have them write an explanation of why the data is sorted the way it is. They should also explain how many other ways the data could be sorted.

4. Have a volunteer from each group explain the data in their table to the rest of the class and the different ways the information could be sorted.

Computer Spreadsheets

Application

SB p. 110

Lesson Objectives

- understand the components of a spreadsheet
- complete a spreadsheet

Activity

Formulas

Purpose: extend the ideas in the lesson

Materials

- PCM 18: Tables, p. 62

What to Do

Have students work in pairs. Distribute a copy of PCM 18 to each pair. Explain that they will be using PCM 18 to create their own spreadsheet like the one they completed on the bottom of student book page 111. Students should use the same labels—1, 2, 3, 4, and A, B, C, D, E, and F. Students can also use the same headings of *Item*, *Quantity*, *Item Cost*, *Subtotal*, *Sales Tax*, and *Total Cost*, or they can create their own headings.

When students have set up their spreadsheets and decided on their headings, have them complete the spreadsheet using data of their choice. Sample data can be found in advertisements and catalogs. Tell students to use formulas in columns D, E, and F.

Be prepared to answer any questions students have as they prepare their spreadsheets.

What to Look For

Some students may have trouble working with a number of formulas. Allow students adequate time to complete the activity. Be available for those students who may require additional help.

Gridding in Mean, Median, and Mode

Tools

SB p. 112

Lesson Objectives

- fill in data analysis answers on a five-column grid
- find mean and median

Activity

The Average Price Is Right

Purpose: reinforce the ideas in the lesson

Materials

- PCM 4: Five-Column Grid, p. 49
- grocery advertisement
- calculators (optional)

What to Do

Distribute a copy of PCM 4 to each student. In this activity, students will gather data by estimating the prices of common grocery items. For example, ask the students to estimate and write down the average price of a loaf of bread. Have 10 students read their prices. Record their estimates on the board. Have students find the mean and median of the list and record the answers in the first two grids on PCM 4. Then reveal the price of a similar product stated in the advertisement. Continue with several more grocery items until all grids are filled.

Discuss, *"How did the actual prices compare to the mean of your estimates? The median? Can you see why the mean or median of a sample is often used to represent a set of data?"*

What to Look For

Students should round to the nearest cent to enter amounts in the grid. Make sure students understand the difference between mean and median. Discuss why a set of data sometimes has no mode or more than one mode.

Unit 4

Displaying Data on a Graph

Unit Overview

The purpose of this unit is to present students with graphs used for displaying and organizing data. Students will learn how to interpret data from pictographs, bar graphs, scatter diagrams, line graphs, and circle graphs. Students will also learn how data can be organized in different ways, depending on the objective.

Why Are Graphs Important? page 117

Have students work individually to complete the checklist at the top of the page and answer questions 1–3. As a group, discuss student responses. Ask volunteers to describe any other instances when they had to use a graph to find information. Discuss where graphs are commonly found, such as on the news, in magazines, and in newspapers. Ask, *"Why do you think graphs are used in these media so often? What kinds of graphs do you see most often? Do you find one kind of graph easier to interpret than others?"*

Talk About It page 117

Have students work with a partner or in small groups to discuss different kinds of graphs. For example, ask, *"What kinds of graphs are usually used to show information about voters and candidates? What kind of data is in such a graph?"* Help students understand that graphs can be used to summarize the data in tables and charts for quick comparison and interpretation. Point out that many of the activities in unit 3 that involved organizing and summarizing data will help them understand how this data is put into graph form.

Working Together page 147

Discuss student responses to questions a and b. Encourage students to share the results of their work with the class. What skills helped the students complete each question?

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
Graphing and Estimating	118	30	Communication/Cooperative Learning	19
Reading a Pictograph	120	30	Reasoning/Hands-On	20
Displaying Business Data	122	31	Reasoning/Cooperative Learning	20
Reading a Bar Graph	124	31	Reasoning/Cooperative Learning	21
Graphing Research Data	126	32	Cooperative Learning	
Scatter Diagrams	128	32	Hands-On/Cooperative Learning	22
Reading a Line Graph	132	33	Reasoning/Cooperative Learning	21
Drawing a Growth Curve	134	33	Hands-On/Cooperative Learning	23
Using Two Data Sources	136	34	Reasoning/Cooperative Learning	
Reading a Circle Graph	138	34	Hands-On/Reasoning	24
Graphing Family Expenses	140	35	Hands-On	24
Data in Different Forms	142	36	Hands-On/Reasoning/Cooperative Learning	25
Gridding in Data Analysis Answers	144	36	Grid Activity	4

Graphing and Estimating

Tools

SB p. 118

Lesson Objectives

- estimate values
- understand how estimated values can be displayed

Activity

Estimating Numbers

Purpose: reinforce the ideas in the lesson

Materials

- PCM 19: Estimating Numbers, p. 63

What to Do

1. Have students work in pairs. Distribute a copy of PCM 19 to each pair. Tell each pair to place the PCM faceup between them.

2. Students should take turns doing the following: One student silently picks a number on the PCM. The student then describes an estimated value of the number. For example, if the student picks the number 9,956, she might say, "I am thinking of a number that is close to ten thousand." The other student then tries to identify the number the student has picked.

3. Allow students to continue playing until they have each had at least three turns.

4. As a variation, have one student pick two numbers and describe an estimated value of their sum. For example, the student may say, "I am thinking of two numbers that when added total about eleven thousand. Which two numbers am I thinking of?" (1,002 and 9,956)

Expansion/Reinforcement: Have students study items a–f in part A of student book page 118. Ask them to write their own example of a number that fits each description. When they are done, have them work in pairs to check each other's work.

What to Look For

Be sure that students feel comfortable rounding large numbers. Remind students that graphs often use estimated numbers, not exact numbers.

Reading a Pictograph

SB p. 120

Lesson Objectives

- understand the components of a pictograph
- read a pictograph
- interpret data from a pictograph

Activity

Making a Pictograph

Purpose: extend the ideas in the lesson

Materials

- PCM 20: Pictographs, p. 64

What to Do

1. Have students work in small groups. Distribute a copy of PCM 20 to each group. Tell students to imagine that they are collecting population data for different age ranges in a midsize town. Suggested age ranges are 0–12, 13–19, 20–29, 30–39, 40–49, 50–64, 65–79, and 80 and over. Students should assign a population figure to each age range they decide to cover.

2. Once students decide on the population figures, tell them to display their findings in a pictograph, using PCM 20. Remind students that they must label their graphs, provide a symbol, and provide a key. Ask them whether any other information must be provided for someone to read their pictographs.

3. When the pictograph is complete, each group should answer the questions on the PCM.

4. When students are finished, have a volunteer from each group explain their pictograph to the class and share their answers to the questions on the PCM.

Variation: Have students exchange PCMs with other groups before answering the questions on the PCM. Students can then answer the questions, based on the PCM they have received.

What to Look For

Be sure that students understand the various components of a pictograph, especially the symbols used to represent information. They should feel comfortable assigning an appropriate value to their keys so that the information can be interpreted efficiently. Be sure students also understand that by drawing half of a symbol, they can represent half of the symbol's value.

Displaying Business Data

Application

SB p. 122

Lesson Objectives

- understand how pictographs can display business data
- use a pictograph to display business and population data

Activity

Real-Life Pictographs

Purpose: reinforce the ideas in the lesson

Materials

- PCM 20: Pictographs, p. 64
- almanacs

What to Do

1. To reinforce previous concepts, discuss the various ways the business data on student book page 122 can be organized. Ask students how the data is organized in the lesson (alphabetically by state). Ask them to name other ways the data could be organized (in order of sales from highest to lowest, or from lowest to highest.)

2. Have students work in groups. Provide each group with an almanac that contains information on different countries, such as population, per capita income, and major exports and imports.

3. Each group should choose one type of information, such as per capita income. Then the group should collect this data for up to eight different countries. Have them organize the information in a recognizable pattern.

4. Distribute a copy of PCM 20 to each group. Have each group create a pictograph that represents their information. Remind students to create a key that defines the amount represented by each pictograph symbol.

5. Have a volunteer from each group share the results of its research. Allow time for questions and discussion.

Reading a Bar Graph

SB p. 124

Lesson Objectives

- understand the components of a bar graph
- read a bar graph
- interpret data from a bar graph

Activity

Understanding Bar Graphs

Purpose: reinforce the ideas in the lesson

Materials

- PCM 21: Bar Graphs, p. 65
- copies of newspaper weather sections

What to Do

1. Discuss the bar graph on student book page 124. Ask, *"Could the information on the vertical axis be displayed in values that increase by ten million instead of fifty million so that the axis shows ten, twenty, thirty, forty, fifty, and so on up to three hundred million?"*

   Discuss student responses. Make sure students understand that even though the information could be displayed in values that only increase

by 10 million, the size of the graph would increase greatly. Also, because of the sizes of the populations being displayed, there is no need to display the information this way. It is much more efficient to display the data with values that increase by 50 million.

2. Now have students form pairs or small groups. Distribute copies of newspaper weather sections to the groups. Have them look at the section that shows the high and low temperatures across the country or around the world.

3. Have each group choose 10 cities and their high or low temperatures. They should organize the data into a recognizable pattern.

4. Distribute a copy of PCM 21 to each student. Have students label the axes and then graph their data. Remind students of the earlier discussion about what scales to use on the axes. Groups should then compare their graphs, looking for similarities and differences.

Variation: Students could choose five cities and create a double bar graph showing the high and low temperatures for each city.

Graphing Research Data

Application

SB p. 126

Lesson Objectives

- round values for graphing
- graph values
- gather data and graph results

Common Difficulties

Some students may have difficulty rounding percents. If so, practice rounding several examples similar to the one on student book page 126. You may also want to explain why data should be rounded in certain situations. Ask students how they would graph 23.7% on the graph at the bottom of student book page 126. Help them realize that it is much easier to graph a whole number than a decimal amount.

Activity

Interpreting Data

Purpose: extend the ideas in the lesson

What to Do

1. Have students refer to their completed bar graphs on student book page 126. Ask, *"Why do the values on the vertical axis only go up to twenty-five?"* (The highest value that needs to be graphed is 24.)

2. Ask students to write two statements that are true according to the information on the bar graph. As a group, discuss student responses.

3. Tell students to write a question that can be answered using the information in the graph. Have students exchange questions with a partner to solve.

Scatter Diagrams

SB p. 128

Lesson Objectives

- understand the purpose of a scatter diagram
- interpret data from a scatter diagram
- use a scatter diagram to display data

Common Difficulties

Students may have difficulty understanding that scatter diagrams show a relationship between two separate groups of data. It may be helpful to ask, *"Could the information in the scatter diagram be displayed easily in a bar graph?"* Help students recognize that a bar graph compares a single set of data while a scatter diagram shows the relationship between two groups of data.

Activity

Gathering and Graphing Data

Purpose: reinforce the ideas in the lesson

Materials

- PCM 22: Scatter Diagrams, p. 66
- newspaper classified ads on apartment rentals

What to Do

1. Have students work in pairs or small groups. Distribute a copy of PCM 22 and a classified ads section of a newspaper to each group.

2. Tell students that they are going to create a scatter diagram to compare the relationship between the number of bedrooms in an apartment and the monthly rent. Each group should gather monthly rent data on studio and one-, two-, and three-bedroom apartments. They should gather at least 20 examples.

3. Have students decide on ranges of values that fully represent the rents in their data—for example, $375–$450, $451–$525, etc.

4. Students should then label the axes of the scatter diagram provided on the PCM (number of bedrooms on one axis and ranges of rents on the other axis). Then give students time to plot their data.

5. Have students answer the questions on the bottom of the PCM. Then compare and discuss their answers as a class.

Reading a Line Graph

SB p. 132

Lesson Objectives

- understand the components of a line graph
- interpret data from a line graph

Activity

Comparing Graphs

Purpose: extend the ideas in the lesson

Materials

- PCM 21: Bar Graphs, p. 65

What to Do

1. Have students work in pairs. Distribute a copy of PCM 21 to each pair. Tell students to construct a bar graph based on the information from the line graph on student book page 132. They should include the same information on the vertical and horizontal axes but use bars instead of points to graph the data.

2. When students have completed their graphs, have each group compare and contrast the two ways to display the same data—the line graph and the bar graph. Ask, *"Which graph displays values?"* (both) *"Which graph best compares values from one year to another year?"* (the bar graph) *"Which graph best displays growth over a period of time?"* (the line graph).

Expansion/Reinforcement: Discuss the double line graph on the bottom of student book page 133. Ask students, *"Could the information on the double line graph be shown on a bar graph?"* Some students may recognize that the information could be displayed on a double bar graph. Have students work in groups to create a double bar graph using PCM 21 and the information provided on student book page 133.

When students have completed their graphs, ask, *"Which graph makes it easier to see the growth in income for men and women from 1970 to 1990?"* Students should see that a double line graph makes it easier to interpret growth over time. Have students compare the advantages and disadvantages of both types of graphs.

What to Look For

Be sure that students recognize that the double line graph makes it easier to visualize both the income growth and growth trends for income over time. The double bar graph might make it easier to compare men's and women's income for a specific year.

Drawing a Growth Curve

Application

SB p. 134

Lesson Objective

- draw a line graph using rounded values from a chart

Activity

Real-Life Line Graphs

Purpose: reinforce the ideas in the lesson

Materials

- PCM 23: Line Graphs, p. 67
- reference materials such as almanacs or statistical abstracts

What to Do

1. As a class, brainstorm different kinds of data that would be appropriate to display on a line graph. Encourage students to name things that change over time, such as manufacturing output, weight gains and losses, or outdoor temperatures over the course of a day.
2. Have students look through the reference materials and choose a topic from which they can draw a line graph. They should choose data that changes over time.
3. Distribute a copy of PCM 23 to each student. Have students label their axes and graph the data they have selected.
4. Have students answer the questions at the bottom of the PCM. Ask them to compare and discuss the graphs they created.

Using Two Data Sources

Problem Solver

SB p. 136

Lesson Objectives

- interpret data from two sources
- use two data sources to solve problems

Common Difficulties

Students may have difficulty understanding how two different data sources can be used to determine one piece of information. They should recognize the difference between using two sets of data to create a scatter diagram and using two data sources to find additional information.

Activity

Interpreting Data

Purpose: reinforce the ideas in the lesson

What to Do

1. Have students work in pairs or small groups. Tell them to refer to part B on student book page 137.
2. Ask each group to write one question that can be answered based on the pictograph (How much did the average monthly housing cost increase from 1970 to 1980?), one question that can be answered based on the line graph (Between which years did the average monthly income increase the most?), and one question that can only be answered by using both graphs (Did the rise in the average monthly housing cost increase along with the average monthly income?).
3. Have pairs or groups exchange questions and answer them. Have volunteers share their questions and answers with the class.

Reading a Circle Graph

SB p. 138

Lesson Objectives

- understand the components of a circle graph
- interpret data from a circle graph

Common Difficulties

Students may have difficulty understanding the three ways that data can be displayed in a circle graph—using percents, fractions, or cents per dollar. Refer them to student book page 138 where the most common ways to display data are explained.

Activity

Making a Circle Graph

Purpose: extend the ideas in the lesson

Materials

- PCM 24: Circle Graph 1, p. 68
- various newsmagazines and newspapers containing circle graphs
- protractors

What to Do

1. Have students look through various magazines and newspapers to find examples of circle graphs. Have them determine if the circle graphs they chose represent data using percents, fractions, or cents per dollar.

2. Have students select information from a newspaper or magazine that could be displayed using a circle graph.

3. When students have decided which information to use, they should choose how to show it in a circle graph. Ask, *"Should you use percents, fractions, or cents per dollar to display your information?"* For example, an article may list the number of votes three different candidates received in an election. Students could use either percents or fractions to show the results.

4. Distribute a copy of PCM 24 and a protractor to each student. Before students begin to graph their data, have them round any data that may be difficult to graph. For example, a value of 24.6% should be rounded to 25%, or a value of $.065 should be rounded to $.07. Have them also combine amounts that are too small or too numerous to show on the graph into one segment. The combined amounts can be shown in a category labeled *other* or *miscellaneous*.

5. Have students add their values on their graph to make sure they total 100%, 1, or $1.00. Discuss different strategies for dividing a circle into sections. Then have students graph the data using the PCM. Have volunteers share their graphs with the class.

What to Look For

Make sure students understand the "other" or "miscellaneous" category. Explain that these categories serve as catchalls for data amounts that are too small or too numerous to show separately.

Graphing Family Expenses

Application

SB p. 140

Lesson Objectives

- complete a circle graph
- interpret data from a circle graph
- relate a circle graph to real-life situations
- choose the best type of graph to represent data

Activity

Graphing the Day

Purpose: extend the ideas in the lesson

Materials

- PCM 24: Circle Graph 1, p. 68
- protractors

What to Do

1. Distribute a copy of PCM 24 and a protractor to each student. Tell students that they will be drawing a circle graph that shows how they spend a typical 24-hour day.

2. Tell students to first choose main activities or categories, such as working, eating, sleeping, shopping, studying, etc. For each activity, they should assign an amount of time rounded to the nearest hour. Remind them that they will need a category such as *miscellaneous* or *other* that includes minor activities that they do for a short time.

3. Tell students to calculate the percent of time per day that they spend on each activity. Remind them that their percents are averages and should total 100%.

4. Have the students display their data on the circle graph provided on the PCM.

5. Have volunteers share their graphs with the class. Ask them to explain how they arrived at the data in their graphs.

Variation: If students have trouble summarizing time for an average day, they can graph how they spent their time yesterday.

What to Look For

Be sure that student circle graphs show an understanding of how to calculate percents and how to use the percents to accurately represent portions of an average day. Remind students that data in a circle graph should always total 100%.

Data in Different Forms

Problem Solver

SB p. 142

Lesson Objectives

- interpret data in different forms
- change data from one form to another

Activity

Understanding Data

Purpose: extend the ideas in the lesson

Materials

- PCM 25: Organizing Data 2, p. 69
- almanac or other data sources
- newspapers and magazines

What to Do

1. Have students work in pairs or small groups. Distribute a copy of PCM 25, newspapers, and magazines to each group. Have students find four graphs, one to represent each type of graph listed on the PCM. If students are unable to locate an example of a particular graph, have them choose data from an almanac or other source that could be displayed on that type of graph.

2. Students should attach the examples they chose under the correct heading on the PCM or on a separate sheet of paper with the correct headings. Under each example, have students list the kinds of information that can be displayed on each type of graph.

3. As a class, discuss what students have listed under each graph. Try to get students to generalize their statements. For example, scatter diagrams are effective in showing the relationship between two sets of data, line graphs are appropriate when showing change over time, circle graphs are good for comparing parts to a whole and to each other, and bar graphs make it easy to compare and read data amounts.

4. Have students choose one of their graphs to present in a different form. On separate paper, have them create a new graph using the same data, and then have them compare the old and the new graphs. Ask, *"Which graph is easier to read? Which graph best represents the data? Why do you think this is so?"*

Gridding in Data Analysis Answers

Tools

SB p. 144

Lesson Objective

- fill in data analysis answers on a five-column grid

Activity

Question and Answer

Purpose: reinforce the ideas in the lesson

Materials

- PCM 4: Five-Column Grids, p. 49

What to Do

Have students work in pairs or small groups. Distribute a copy of PCM 4 to each student. Explain that they will be considering the following situation: a school had T-shirts printed in various adult and youth sizes. Then write on the board the number of T-shirts in each size:

Sizes	Adult	Youth
Small	0	30
Medium	80	150
Large	200	200
Extra Large	90	100

Have each group discuss the best way to graph the data and then write two word problems based on the data. One problem should require multiple steps, and the other should have a fraction or decimal answer. Call on students to read a problem, and have the entire class solve and grid the answer.

What to Look For

In order to form fraction and decimal problems, students will need to use their understanding of ratio, proportion, and percent.

Unit 5

Analyzing Data

Unit Overview

The purpose of this unit is to present students with ways to analyze different forms of data. Students will learn to use data to interpolate and extrapolate values, draw conclusions, distinguish between accurate data and misleading data, and understand correlation. The unit will also introduce students to probability concepts.

When Do I Analyze Data? page 149

Have students work individually to complete the checklist at the top of the page and answer questions 1–3. Ask volunteers to describe instances when they made a decision based on information they were given. Discuss how people use information sources in their daily lives. Ask students if they have ever purchased a product based on product label information or an advertisement about that product. Then discuss student responses to questions 1–3. Encourage students to share their responses so they see that there can be a variety of answers to the same question.

Talk About It page 149

Have students work with a partner or in small groups to discuss their experiences with salespeople. Have they ever dealt with a salesperson when purchasing a car or appliance? Lead a discussion about how difficult it can be to determine when you are receiving good information, when you are receiving misleading information, and when information is being withheld by a salesperson. Be sure students understand that by analyzing certain kinds of data, they can sometimes determine whether they are getting good information. Tell them that many of the activities discussed in unit 4 that involved graphing and interpreting data will help them understand how to analyze information.

Working Together page 179

Discuss student responses to activities 1–3. Encourage students to share their responses with the class or to discuss them in small groups. Ask students to give an explanation for each response.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages In		Activity Type	PCM
	SB	TRG		Number
Interpolation and Extrapolation	150	39	Reasoning/Hands-On	26
Drawing Conclusions from Data	152	39	Communication/Reasoning	
What More Do I Need to Know?	154	40	Reasoning/Hands-On	27
Getting More Information	156	40	Communication/Reasoning	
Understanding Correlation	158	41	Hands-On/Cooperative Learning	28
Analyzing Correlation	160	41	Reasoning/Cooperative Learning	
Profit Analysis	162	42	Reasoning/Cooperative Learning	
Introducing Probability	166	43	Hands-On/Cooperative Learning	29, 30
Using Probability for Prediction	168	43	Hands-On/Reasoning	31
Probability of Successive Events	170	44	Hands-On/Reasoning	
Sampling a Population	172	44	Reasoning/Cooperative Learning	
Sampling and Margin of Error	174	45	Reasoning/Cooperative Learning	
Gridding in Probability Answers	176	45	Grid Activity	4

Interpolation and Extrapolation

SB p. 150

Lesson Objectives

- understand interpolation and extrapolation
- find values within a given set of values
- find values outside a given set of values

Common Difficulties

Students may have trouble with extrapolation—understanding how to find and use the number patterns to determine an unknown value outside a given set of values. Help students to recognize existing patterns. Then guide them to extend the patterns.

Activity

Finding Patterns

Purpose: reinforce the ideas in the lesson

Materials

- PCM 26: Number Patterns, p. 70

What to Do

1. Distribute a copy of PCM 26 to each student. Tell students to cut out the numbers on the left and arrange these numbers in the following order: 1,200; 1,250; 1,300; 1,350; 1,400; 1,450; and 1,500.

2. Ask students, *"What pattern do the numbers in this set follow? By what amount does each number increase?"* (The numbers increase by 50.)

3. Next, have students cut out and arrange the numbers on the right of the PCM in the following order: 2,025; 2,075; 3,000; 3,050; 3,075; 4,025; and 4,050. Ask students, *"What pattern does this set of numbers follow?"* (The numbers increase by 50, then 25, then 50 again, then 25.)

4. Ask students, *"If this pattern continues, what will be the next number?"* (5,000) *"What will be the next number after five thousand?"* (5,025).

5. Next, have students arrange these numbers in the following order: 1,300; 1,350; 1,450; and 1,500. Ask, *"What is the pattern between the first two numbers and the last two numbers?"* (The numbers increase by 50.) *"What number should lie between one thousand three hundred fifty and one thousand four hundred fifty?"* (1,400)

6. Have students use the numbers from the PCM to create a pattern that increases and then decreases. Ask them to exchange their number sets and have another student find the pattern.

What to Look For

Be sure that students can identify a number pattern to find a missing number. They should also be able to extend the pattern. This will reinforce their understanding of extrapolation and interpolation.

Drawing Conclusions from Data

SB p. 152

Lesson Objectives

- determine when a statement is justified according to given data
- determine when a statement is not justified according to given data

Activity

Data Facts

Purpose: reinforce the ideas in the lesson

What to Do

1. Have students work in pairs or small groups. Tell students to choose one of the three graphs on student book pages 152 and 153.

2. Tell students to write two statements about their graph. One should be a statement that is justified according to the graph. The other should be a statement that is not justified according to the graph. Their statements should be different from those in the student book.

3. Have volunteers share their statements with the class without revealing if the statement is justified or not justified.

4. Have the other students determine if the statement is justified or not justified. Have students explain their reasoning.

What More Do I Need to Know?

Problem Solver

SB p. 154

Lesson Objectives

- determine when more data is needed to answer a question
- identify necessary data

Common Difficulties

Students may be able to recognize when they do not have enough information to solve a problem, but they may have difficulty identifying the necessary data.

Activity

Creating Data

Purpose: reinforce the ideas in the lesson

Materials

- PCM 27: Circle Graph 2, p. 71

What to Do

1. Distribute a copy of PCM 27 to each student. Have students make up a topic for the circle graph. For example, the segments of the circle graph could represent voting results, or how money in a budget is spent, etc. Students can choose any topic they wish.

2. Have students give their circle graph a title and label each segment.

3. Have students write two statements about their graphs—a statement that is justified by the data in the graph and a statement that is not justified by the data in the graph. They should not indicate which statement is which.

4. Have students exchange graphs with a partner. The partner should determine which statement is justified and which one is not. For the statement that is not justified, have students say why not.

5. Have volunteers share their circle graphs with the class and explain their two statements.

Getting More Information

Application

SB p. 156

Lesson Objectives

- understand when more data is needed to make a good decision
- determine where to find the needed data

Activity

Real-Life Decision Making

Purpose: reinforce the ideas in the lesson

Materials

- newspapers

What to Do

1. Have volunteers list situations in which they wished they had had more information before they did or bought something. Have the rest of the class identify the kind of information that would have been helpful in the situation. For example, one student might say, "I wish I had known more before I purchased a used car. The one I bought has cost me a fortune in repairs." Have the class give ideas about how the situation might have been avoided.

2. Have students look through newspapers for sales ads or classified ads. Ask them to find examples of items about which they would need additional information. Have students list the information they would need before they made the purchase.

3. Have volunteers share their examples and reasoning with the class.

Expansion/Reinforcement: Discuss how students could organize data to help them make a purchasing decision. Students might suggest using tables and graphs. Some examples might be a table with columns that read Item, Cost, and What I Need to Know or a scatter diagram showing price and age ranges for used cars listed in the classified ads. Have students give explanations for their choices.

Understanding Correlation

SB p. 158

Lesson Objectives

- understand correlation as relationships between data values
- identify positive correlations and negative correlations
- use a scatter diagram to determine if a correlation exists

Common Difficulties

Students may have difficulty distinguishing between a positive correlation and a negative correlation. To some students, the lines on the two graphs at the top of student book page 158 might look the same. They both seem to go up. Explain that a positive correlation means that, as one value increases, so does a second value. A negative correlation means that as one value increases, a second value decreases.

Activity

Displaying Correlations

Purpose: reinforce the ideas in the lesson

Materials

- PCM 28: Correlations, p. 72

What to Do

1. Have students work in pairs. Distribute a copy of PCM 28 to each pair. Refer them to question 3 in part B on student book page 159.

2. Tell students to use the PCM to create a graph based on question 3. Explain that the graph has already been started. Students need to decide on five possible prices to charge for a sandwich. Then they should make up sales figures for each price per sandwich.

3. Have students graph the information and give the graph an appropriate title.

4. Ask volunteers to share their graphs with the class, explaining the data in the graph and whether the graph shows a positive or negative correlation.

Analyzing Correlation

Problem Solver

SB p. 160

Lesson Objectives

- identify when data shows both positive and negative correlations
- interpret data that shows both positive and negative correlations
- make predictions based on correlations

Common Difficulties

Some students may have difficulty understanding the correlations displayed on the graphs on student book pages 160 and 161. They may find it difficult to

identify when a positive correlation ends and a negative correlation begins. Reinforce that positive correlations show that as one value increases, so does a second value, while negative correlations show that as one value increases, a second value decreases.

Activity

Reviewing Correlations

Purpose: reinforce the ideas in the lesson

What to Do

Have students work in pairs or small groups. Tell them to discuss the components of graphs that show a correlation. (values on the vertical axis and the horizontal axis; a line that shows a relationship between the two sets of values; a title)

List these questions for students to discuss:

- Will the line on a graph showing a negative correlation always go down? (yes)
- Will the line on a graph showing a positive correlation always go up? (yes)
- Can correlations help you make predictions? (Yes. For example, if a correlation shows that as the cost of an item increases, its sales decrease, then you could predict that an increase in the cost of another item would also result in a decrease in sales.)

Expansion/Reinforcement: Working in small groups, have students create sets of data that show a positive correlation, a negative correlation, or both. Then have them draw and label a graph of the data. They can use the graphs on student book pages 158–161 as examples. Have volunteers explain their graphs to the class.

Profit Analysis

Application
SB p. 162

Lesson Objectives

- interpret a profit analysis graph
- interpret correlations on a profit analysis graph

Common Difficulties

Students may have difficulty understanding how the data in Graph A and Graph B on student book page 162 relates to Graph C. It may help to review the data that can be obtained from Graph A and Graph B alone. For example, Graph A also shows that, at a selling price of $7, John makes a profit of $3; at a selling price of $6, John makes a profit of $2, and so on. Graph B also shows that, at a selling price of $9, John can sell 10,000 trucks; at a selling price of $10, John can sell 5,000 trucks, and so on.

Activity

Understanding Profit Analysis

Purpose: reinforce the ideas in the lesson

Materials

- advertising flyers for electronics or appliances

What to Do

1. Have students work in small groups. Distribute advertising flyers to each group. Ask students to look through the flyers and choose a *type* of product they would like to purchase, such as a stereo system. Next, have them narrow down their choices to one or two models. They should use price and features to guide their decision. Then give the groups time to create a list of the factors that influenced their decision.
2. Each group should then decide which make and model to purchase. As a class, discuss why some of the other models were *not* chosen. Ask, *"Which models priced themselves out of competition? Did you always choose the least expensive model?"*

Discuss possible factors that manufacturers consider when pricing products (cost, quality of materials, competitors' prices). Ask, *"What do manufacturers have to keep in mind when pricing products?"* (cost of manufacturing and selling versus the price customers will pay)

Introducing Probability

SB p. 166

Lesson Objectives

- understand probability as the study of chance
- express probability in three forms

Common Difficulties

Students may have difficulty understanding a concept as abstract as probability. Remind students that probability is about *possible* outcomes, not *guaranteed* outcomes. The fact that the probability of rolling a die and getting a six is $\frac{1}{6}$, or 1 chance in 6, does not guarantee that in six rolls of a die one roll will be a six. It is *probable* that a six would be rolled, but not *guaranteed*.

Activity

What's the Chance?

Purpose: reinforce the ideas in the lesson

Materials

- PCM 29: Spinner, p. 73
- PCM 30: Probability Chart 1, p. 74
- paper clips
- pencils

What to Do

1. Have students work in small groups. Distribute a copy of PCM 29 and PCM 30 to each group.
2. Have students list the probabilities asked for at the bottom of PCM 29.
3. Ask students to test each probability they listed on the PCM. Show students how to use sharpened pencils and partially opened paper clips to make a spinner. Since the probability of landing on a dotted section is three chances in eight, have students spin the spinner eight times. Ask, *"How many times did the spinner land on a dotted section?"*
4. Have students chart their results in the table on PCM 30. Under "Probability" students should list the probability of each result from PCM 29 and the number of spins for each type. Then they should fill in the number of times the spinner actually landed on that section for each type.
5. Students should summarize their predictions and actual results on the lines provided. Then they can compare their predictions to the actual results.
6. Have volunteers from each group share their results with the class. Compare results from group to group to see how close the outcomes were to the probabilities.

Using Probability for Prediction

Tools

SB p. 168

Lesson Objectives

- understand how probability can be used to make predictions
- use probability to predict outcomes

Activity

Predicting Results

Purpose: reinforce the ideas in the lesson

Materials

- PCM 31: Probability Chart 2, p. 75
- several coins

What to Do

1. Have students work in groups. Distribute coins and a copy of PCM 31 to each group.
2. Tell students to predict how many times heads will come up and how many times tails will come up if they toss a coin 20 times. Then have students flip the coin 20 times and tally the number of heads and the number of tails.

3. Ask students to predict the results if the coin is flipped 40 times. Have them flip the coin 40 times and tally the number of heads and the number of tails.

4. Have students study their results. Tell them to predict their results if they flipped the coin 60 times and to test their predictions.

5. Discuss the predictions made by the various groups and their actual results. How close were their actual results to their predictions?

What to Look For

Be sure that students understand how to make an appropriate prediction and how to test that prediction. They should also see that predictions are sometimes accurate, sometimes close to being accurate, and sometimes not at all accurate.

Probability of Successive Events

SB p. 170

Lesson Objectives

- understand successive events
- find the probability of successive events occurring
- make predictions based on the probability of successive events

Activity

Discussing Probability

Purpose: reinforce the ideas in the lesson

Materials

- newspaper sports sections

What to Do

1. Review problem 7 on student book page 171. Tell students that they are going to write their own probability problems about successive events.

2. Have students work in pairs. Distribute a sports section to each pair. Students can use information from the sports pages or create their own statistics. Have them choose a sport, a player, and a situation.

3. Students should then write a problem similar to problem 7. For example, say, *"Ramón got fifty hits in one hundred times at bat. What is the approximate probability he will get hits in his next two times at bat in this game?"* ($\frac{5}{100} = \frac{1}{2}$; $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ or 25%) Ramón's chances are 1 in 4, or 25%, that he will get a hit in his next 2 times at bat.

4. Have pairs exchange and solve problems. Let the class discuss their findings.

Sampling a Population

Application

SB p. 172

Lesson Objectives

- become familiar with the concept of representative sampling
- understand how to conduct a sampling
- identify an appropriate representative sampling

Activity

Understanding Sampling

Purpose: reinforce the ideas in the lesson

What to Do

1. Have students work in groups. Tell them to review the situations listed in "Making Connections: Choosing a Representative Sample" on student book page 173.

2. Have each group create four situations of its own where it would be more practical to poll a representative sample rather than a whole population.

3. Have students discuss what the population is and what the representative sample would be in each situation. Ask, *"Is each sample representative of the population?"*

Sampling and Margin of Error

SB p. 174

Lesson Objectives

- become familiar with the concept of margin of error
- understand the use of percent in margin of error
- determine the range of possible conclusions using margins of error

Activity

Exploring Concepts

Purpose: reinforce the ideas in the lesson

Materials

- magazines and newspapers with articles featuring surveys

What to Do

1. Discuss how frequently surveys are reported in magazines and newspapers. Tell students that there are companies that specialize in conducting surveys and tallying the results. Inform them that a reliable survey will have a margin of error no greater than ±5%.

2. Have students work in groups. Distribute magazines and newspapers to each group. Each group should look for surveys or polls. You can use one survey for the entire class if necessary.

3. Have students locate the margin of error of their survey. Have them calculate the ranges for the survey results in view of the margin of error. For example, if survey results showed that 54% of the sample polled eat cereal for breakfast, a ±4% margin of error would tell you that somewhere between 50% and 58% of the target population eat cereal for breakfast.

4. Have students discuss the impact of margin of error on survey results.

Gridding in Probability Answers

Tools

SB p. 176

Lesson Objectives

- fill in probability answers as fractions or decimals on a five-column grid

Activity

What's the Chance?

Purpose: extend the ideas in the lesson

Materials

- PCM 4: Five-Column Grids, p. 49
- deck of playing cards with the aces removed

What to Do

Distribute a copy of PCM 4 to each student. Review the composition of a deck of cards with the class. With the aces removed, there are 48 cards. Pose the problems below to the class. Have students solve each problem individually and grid each answer on PCM 4. Students may assume that drawn cards are always replaced before the next question is asked. Answers should be in lowest form.

If a card is drawn, what is the chance that it is . . .

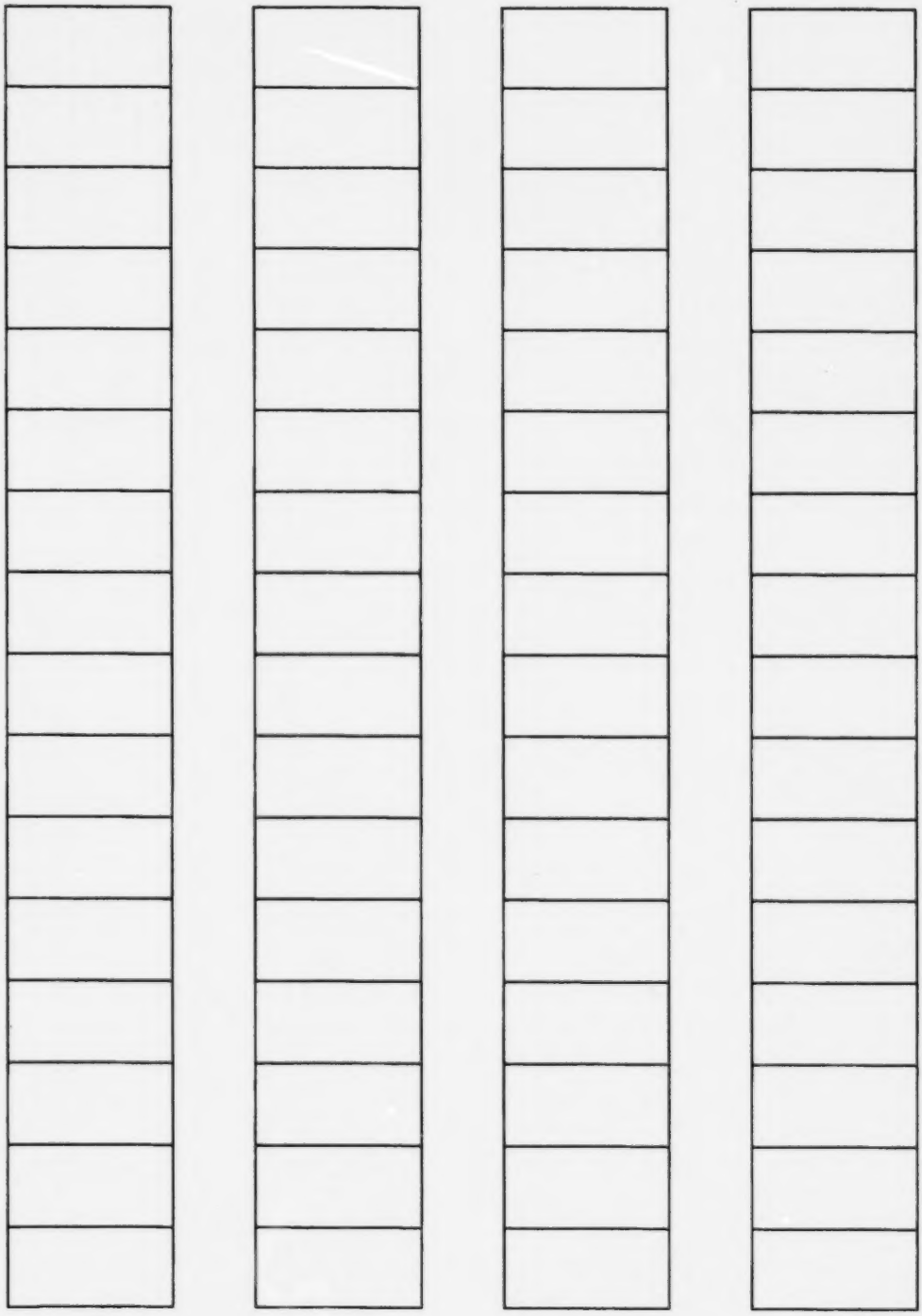
1. a face card?
2. an even number?
3. either a heart or a diamond?
4. a 6, 7, 8, or 9?
5. not a king?
6. not a club?
7. neither a 6 nor an 8?
8. a club less than 10 and greater than 1?
9. a face card that is also a heart?

Answers:

1. 1/4	4. 1/3	7. 5/6
2. 5/12	5. 11/12	8. 1/6
3. 1/2	6. 3/4	9. 1/16

PCM 1

Fraction Bars



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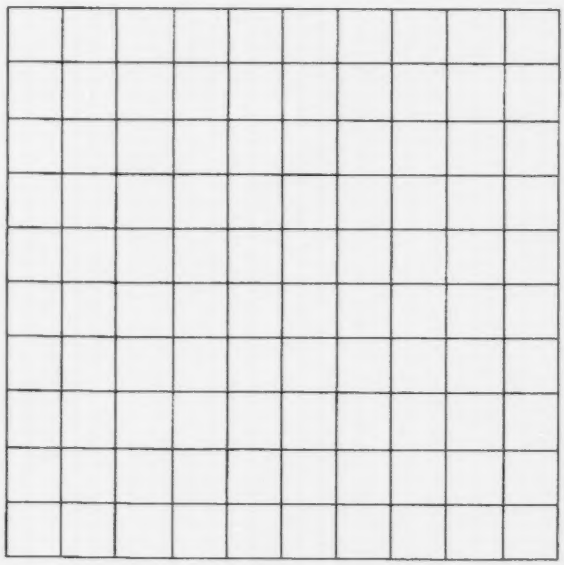
PCM 2

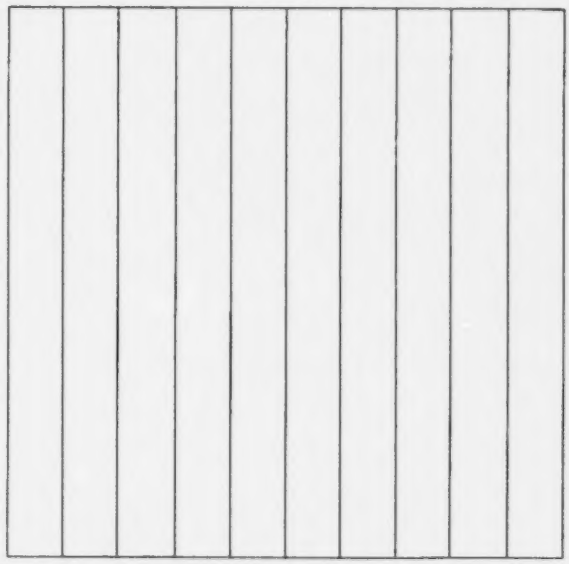
Decimal Place Value

Ones	. (decimal point)	Tenths	Hundredths	Thousandths

Hundredths Squares



Tenths Bars



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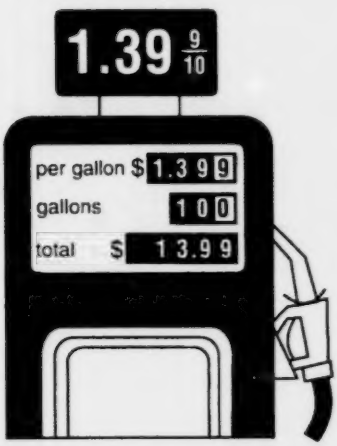
PCM
3 Drawing on Your Skills

Write four different word problems based on the drawings provided. Use each of the four basic operations in your problems: addition, subtraction, multiplication, and division.



1. _____

2. _____

3. _____

4. _____

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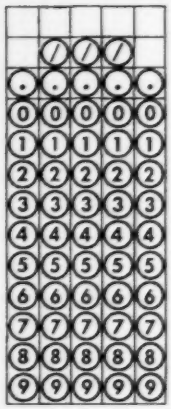
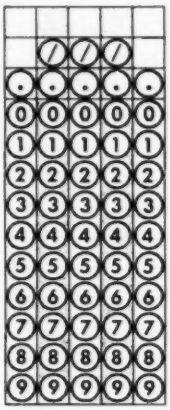
PCM 4

Five-Column Grids

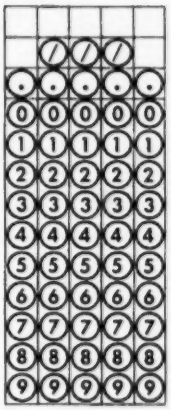
1.



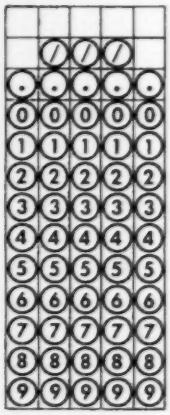
4.



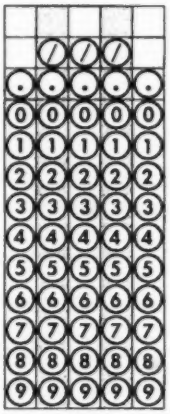
7.



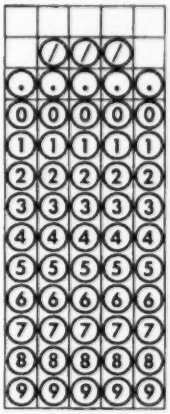
2.



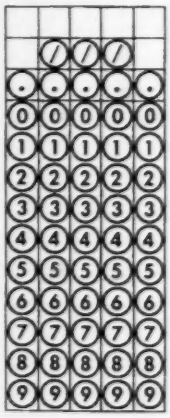
5.



8.



3.



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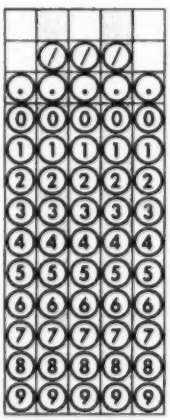

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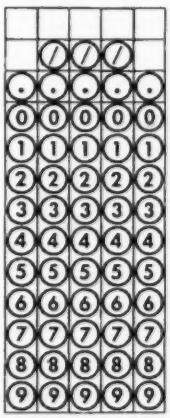

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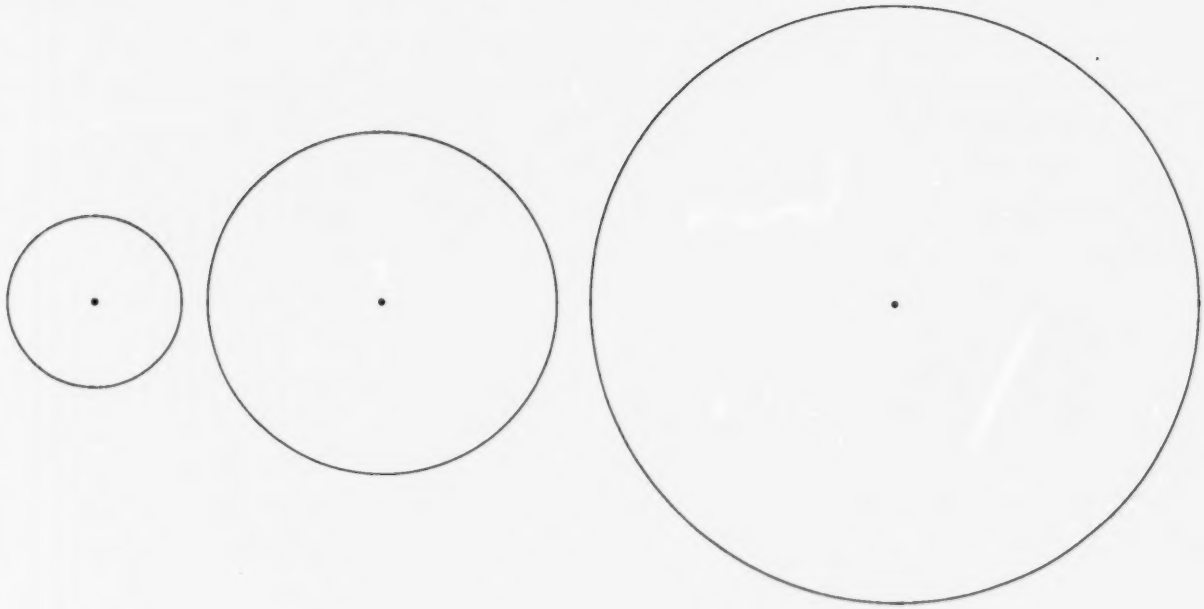
PCM 5

Circles



Circle A

C_1 = _____

C_2 = _____

Circle B

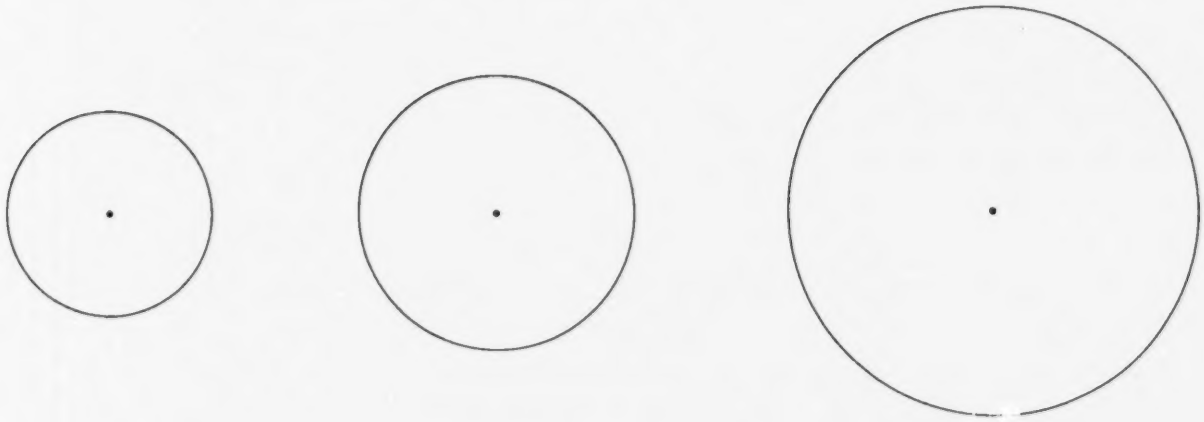
C_1 = _____

C_2 = _____

Circle C

C_1 = _____

C_2 = _____



Circle D

C_1 = _____

C_2 = _____

Circle E

C_1 = _____

C_2 = _____

Circle F

C_1 = _____

C_2 = _____

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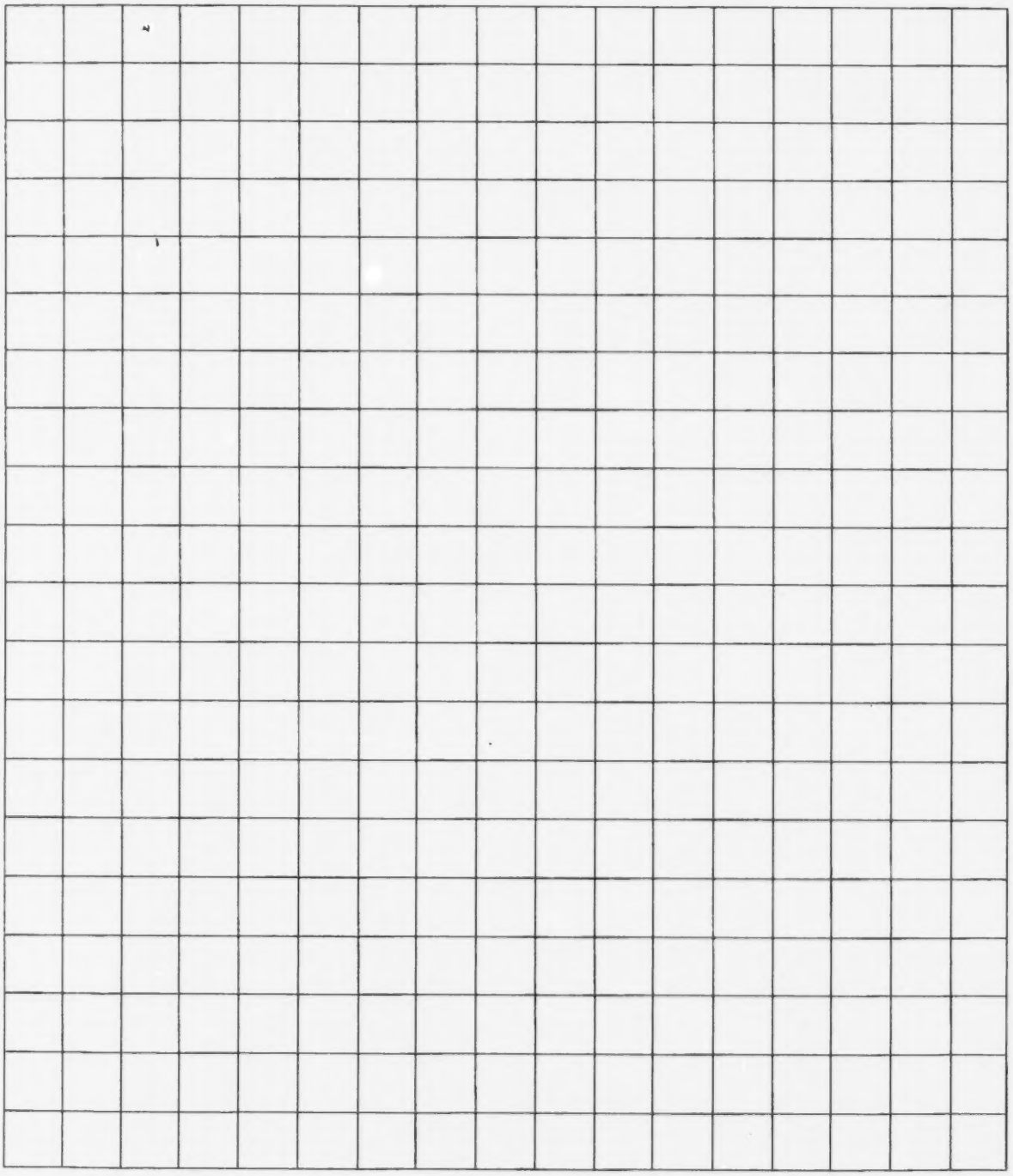
PCM 6

Centimeter Squares



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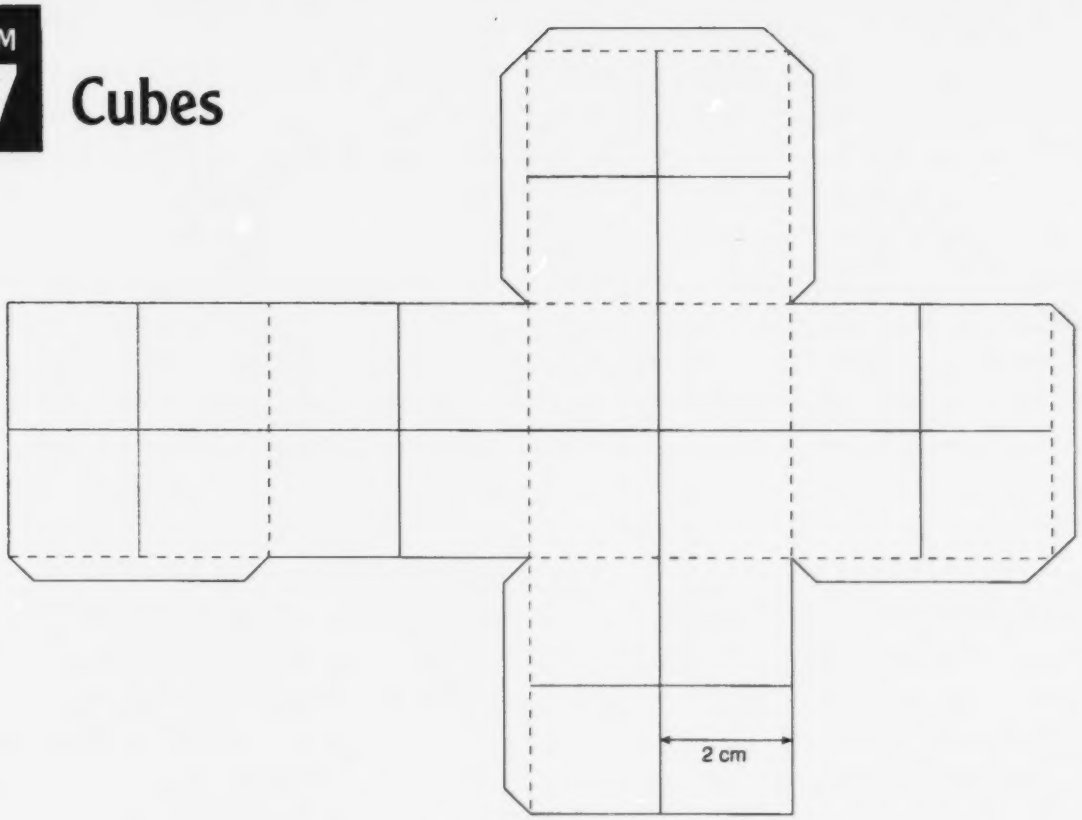
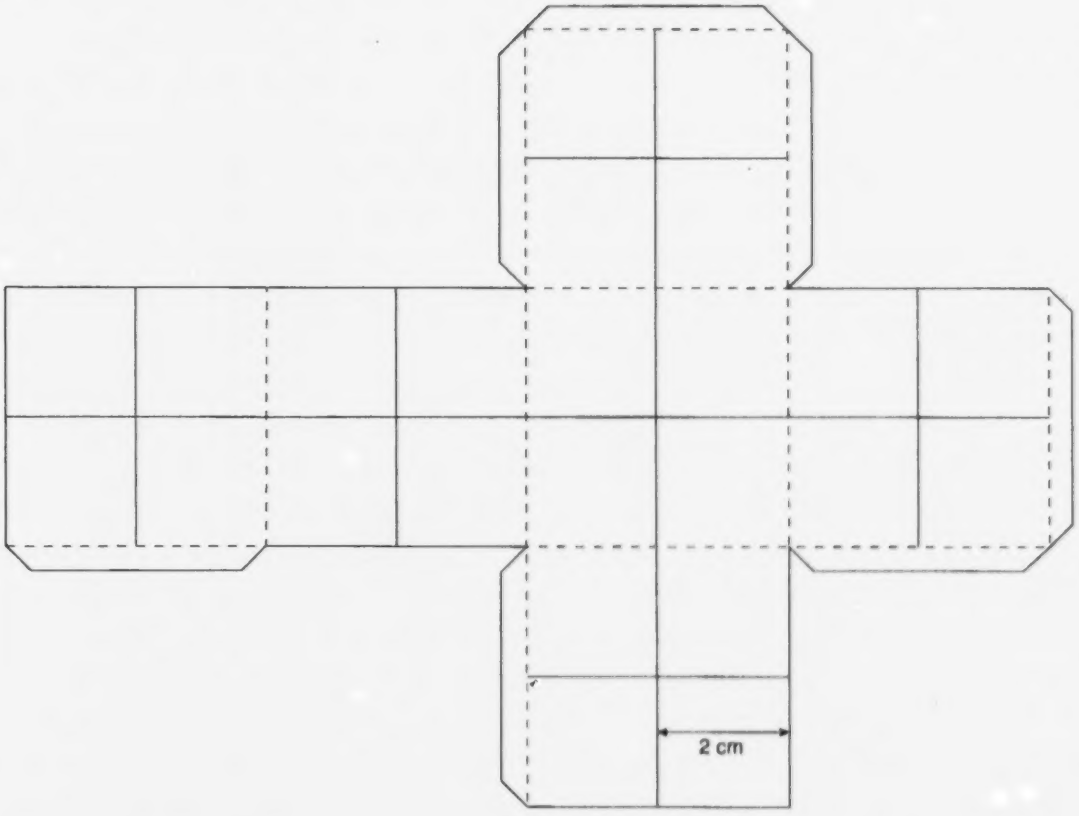
PCM 7

Cubes





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PCM 8

Calendar

Month: _____

1. What is the date of the second Tuesday of the month? _____
2. How many working days are on your calendar? _____
3. How many days are there between the 11th of the month and the 19th? _____

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PCM 9

Time, Distance, and Rate

Distance Formula: $d = rt$, where d = distance, r = rate, and t = time

Rate Formula: $r = \frac{d}{t}$, where d = distance, r = rate, and t = time

Time Formula: $t = \frac{d}{r}$, where d = distance, r = rate, and t = time

Decide which of the following each question is asking you to find: distance, rate, or time. Then use the correct formula to solve each problem.

1. How long will it take Alonzo to travel 385 miles if he drives at an average speed of 55 miles per hour?
   a. I need to find _____.
   b. Formula to use: _____
   c. Solution: _____

2. What is the average speed Eiko must walk if she wants to walk 5 miles in 2 hours?
   a. I need to find _____.
   b. Formula to use: _____
   c. Solution: _____

3. Flying at an average speed of 200 miles per hour, how far can a pilot travel in $2\frac{1}{2}$ hours?
   a. I need to find _____.
   b. Formula to use: _____
   c. Solution: _____

4. Use a map to choose a starting point and a destination. Then write a question that can be solved using one of the formulas at the top of the page.

   _____

   _____

   _____

   _____

   a. I need to find _____.
   b. Formula to use: _____
   c. Solution: _____

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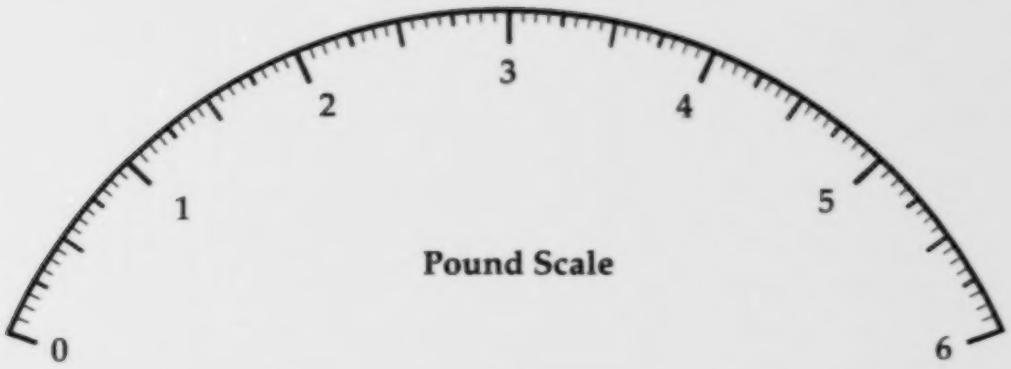
PCM
10

English Scale



A. _____

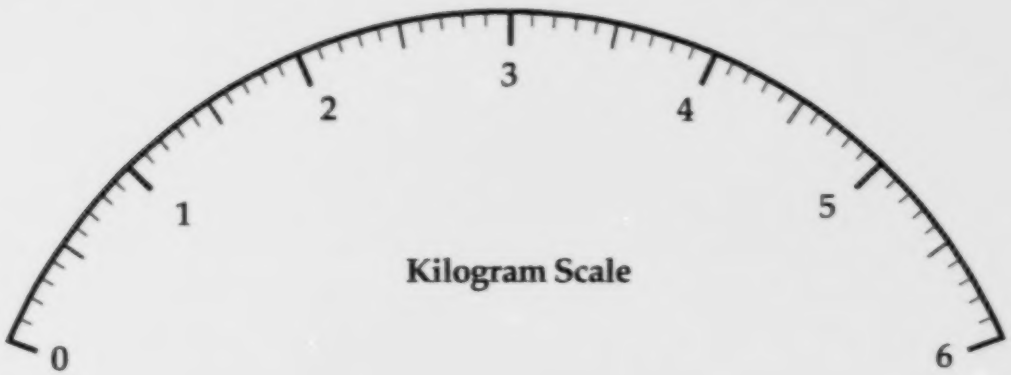
B. _____

C. _____

D. _____

PCM
11

Kilogram Scale



A. _____

B. _____

C. _____

D. _____

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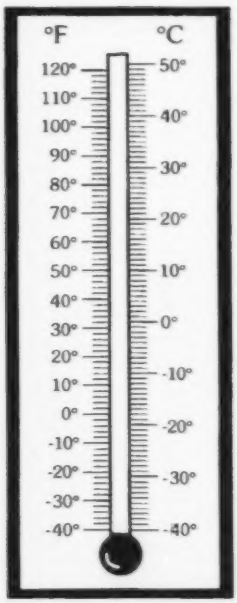
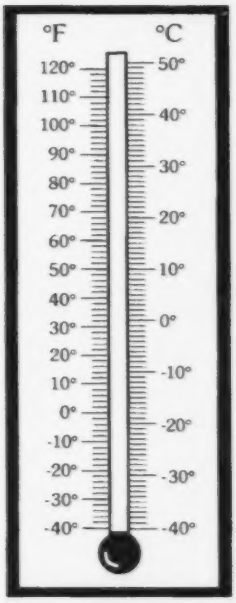
PCM 12

Thermometers

Weather Thermometers





Clinical Thermometers

Celsius

Celsius normal body temperature: 37°C

Fahrenheit

Fahrenheit normal body temperature: 98.6°F

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PCM
13 Tally Sheet

Survey question: _____

_____

_____

Yes	No	Undecided

Final tally of responses: Yes _____ No _____ Undecided _____

Summary of data: _____

_____

_____

One fact based on the findings: _____

_____

_____

Another fact based on the findings: _____

_____

_____

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PCM 14

Line Plots

Title: _____

_____

Range of Values

What kind of data are you displaying? _____

_____

_____

_____

How did you determine your range of values? _____

_____

_____

_____

Summary of data: _____

_____

_____

_____

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PCM

15 Organizing Data 1

Information	Sorted by _____	Sorted by _____

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PCM
16 Number Cards

75	64	19
79	68	82
24	89	60
73	80	45

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PCM
17 Nutrition Table

Answer the questions about the foods listed in the nutrition table. Then write three different questions that can be answered using the information provided in the table.

Serving	Calories	Total Fat	Cholesterol	Sodium	Protein
Yogurt, 1 c.	170	3 g	15 mg	110 mg	7 g
Orange juice, 8 fl. oz.	120	0 g	0 mg	20 mg	2 g
Cereal, $\frac{1}{2}$ c.	95	2 g	5 mg	110 mg	2 g
Crackers, 5	80	4 g	0 mg	135 mg	1 g

1. Which of the foods listed is highest in sodium? _____

2. Which food contains no fat? _____

3. How much fat is in 1 cup of cereal? _____

4. How much fat would 10 crackers contain? _____

5. a. Name the food with the highest total fat. _____
   b. Does it also have the highest amount of cholesterol? _____
   c. Which food has the highest amount of cholesterol? _____

6. _____

7. _____

8. _____

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PCM

18 Tables

How is your data sorted? _____

_____

_____

How else could your data be sorted? _____

_____

_____

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Estimating Numbers

1,002	30,721	8,212
9,956	6,312	100,009
1,800	17,820	8,700
395,192	6,215	967
455,189	15,114	3,589

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PCM

20 Pictographs

Title: _____

Key:

How did you determine the value for your key? _____

_____

Write a statement that is true according to the information in your graph. _____

_____

Write a statement that is not true according to the information in your graph. _____

_____

Write a question that can be answered by using the data in your pictograph. _____

_____

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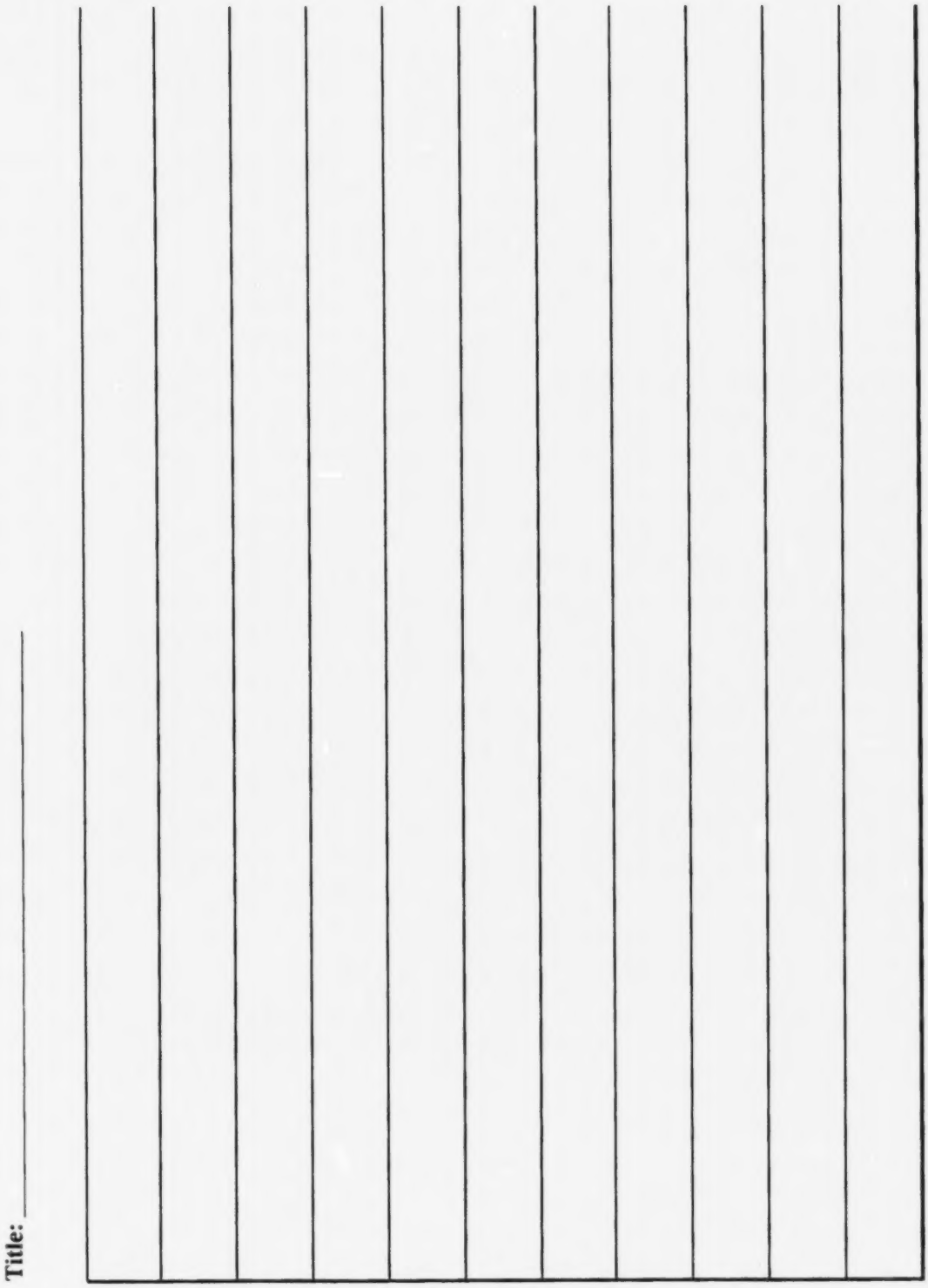
PCM
21 Bar Graphs



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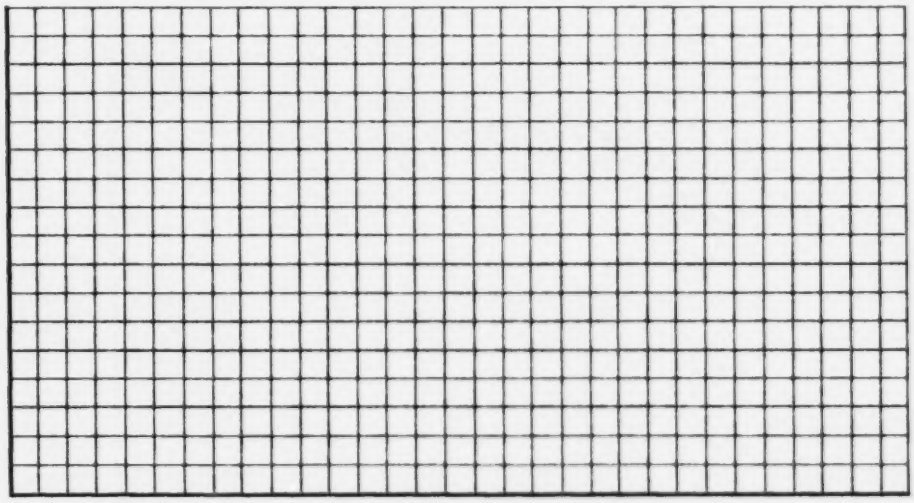
PCM

22 Scatter Diagrams

Collect data on the assigned topic. Label the axes below. Then plot the data you have collected.

Title: _____



1. Describe how you labeled the axes on your diagram. Did you have to use a range of values? How did you decide which ranges to use? _____

   _____

2. How would you plot two amounts that are the same? _____

   _____

3. Which category had the most values? _____

   _____

4. Describe any relationship that exists between the categories being compared. _____

   _____

5. Write a problem that can be answered using your scatter diagram. _____

   _____

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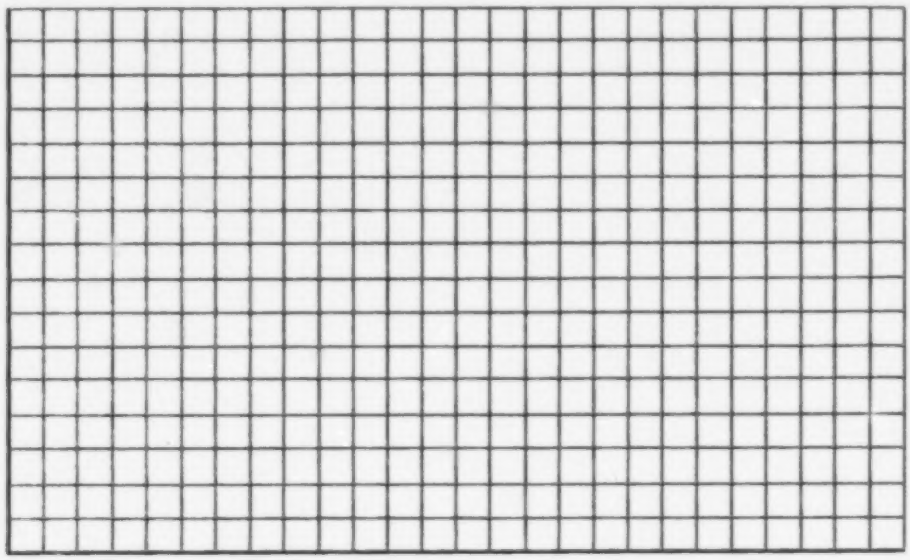
PCM
23 Line Graphs

Collect data on the assigned topic. Label the axes below. Then plot the data you have collected.



1. What is your data topic? _____

2. What is the source of the data? _____
   Be sure to list the source beneath your graph.

3. Why did you choose this topic to graph? _____

   _____

4. Describe any trend shown on the graph. _____

   _____

   _____

5. Write a statement that is true according to the graph. _____

   _____

   _____

6. Write a problem that can be answered using the line graph. _____

   _____

   _____

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PCM
24 Circle Graph 1

$\frac{1}{4}$	$= 25\%$
$\frac{1}{3}$	$= 33\frac{1}{3}\% \approx 30\%$
$\frac{1}{2}$	$= 50\%$
$\frac{2}{3}$	$= 66\frac{2}{3}\% \approx 70\%$
$\frac{3}{4}$	$= 75\%$

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PCM

25 Organizing Data 2

Find an example of each kind of graph. Attach each example under the correct heading. Then list the kinds of information that can be displayed on each type of graph.

Circle Graph

Bar Graph

Scatter Diagram

Line Graph

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PCM
26 Number Patterns

1,450	4,025
1,350	3,075
1,250	2,025
1,500	3,000
1,200	4,050
1,400	3,050
1,300	2,075

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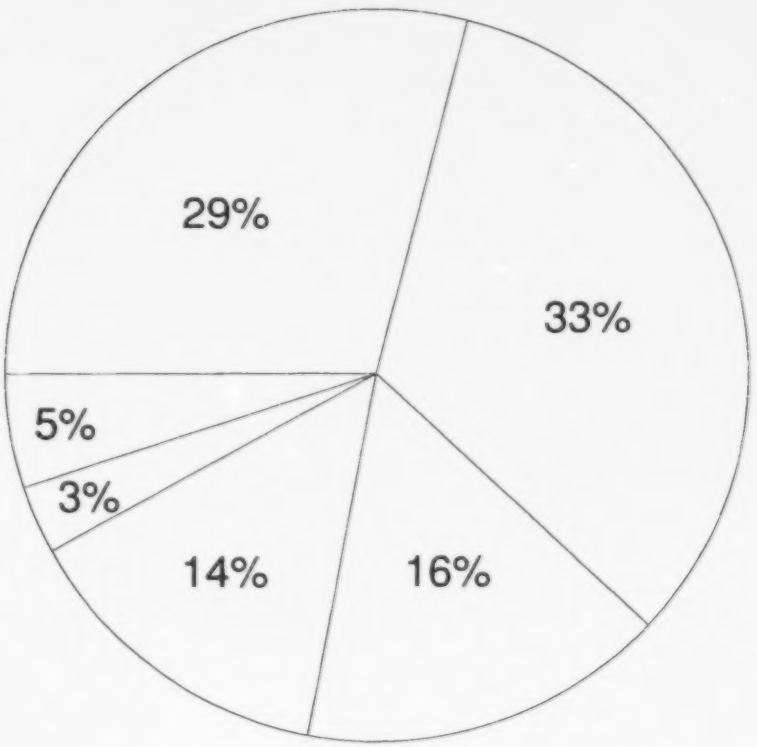
PCM

27 Circle Graph 2



Statement 1: _____

_____

_____

☐ justified ☐ not justified

Statement 2: _____

_____

_____

☐ justified ☐ not justified

Why is it not justified? _____

_____

_____

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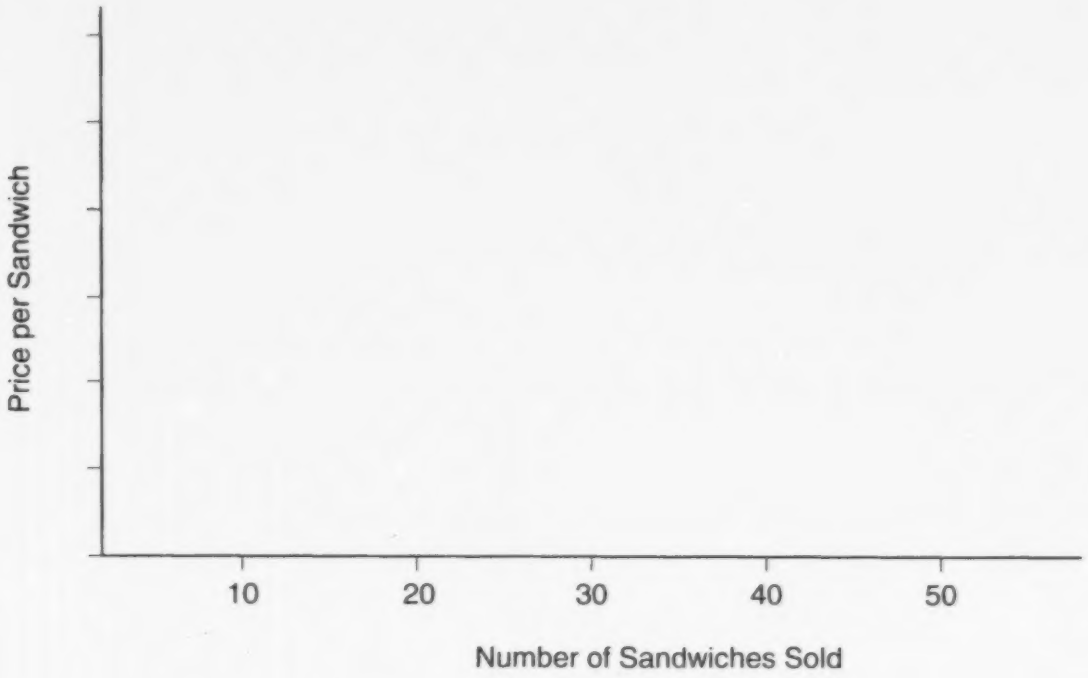
PCM

28 Correlations

Title: _____



Does your graph show a positive or negative correlation? _____

_____

_____

Why do you think this is so? _____

_____

_____

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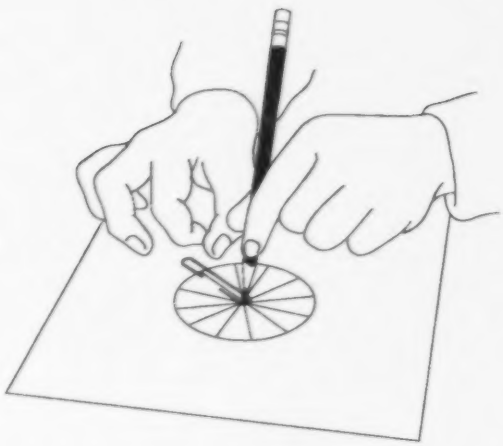
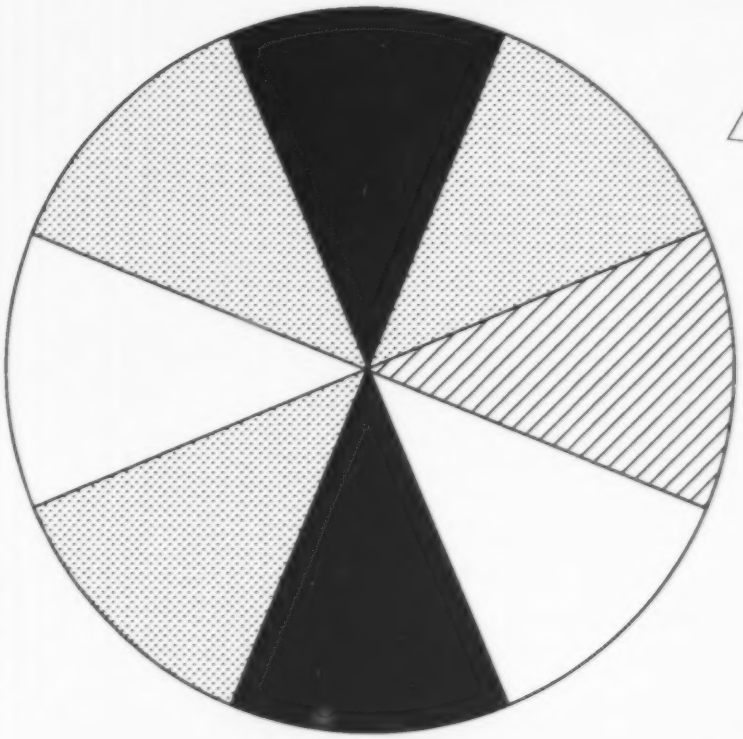
PCM
29 Spinner

To use a spinner, partially open a paper clip and place one end at the center of the spinner. Hold it in place with the point of a pencil. Flick the other end of the paper clip to spin it. If the paper clip lands on a line, spin again.





What is the probability of the spinner landing on:

1. a dotted section? _____
2. a shaded section? _____
3. a striped section? _____
4. an unshaded section? _____

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PCM 30

Probability Chart 1

Section	Probability	Number of spins	Number of times spinner landed on this section
Dotted			
Shaded			
Striped			
Unshaded			

Prediction: _____

_____

_____

_____

Actual Results: _____

_____

_____

_____

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PCM 31

Probability Chart 2

Number of flips	Heads	Tails

Prediction: _____

_____

_____

_____

_____

_____

_____

Actual Results: _____

_____

_____

_____

_____

_____

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Answer Key

Answers not given within the *TRG* activity pages are given here.

PCM 5: Circles

Circle A: $C = 3.14$ in.

Circle B: $C = 6.28$ in.

Circle C: $C = 10.99$ in.

Circle D: $C = 9.42$ cm

Circle E: $C = 12.56$ cm

Circle F: $C = 18.84$ cm

PCM 8: Calendar

1–2. Answers vary depending on the chosen month.

3. There are 7 days between the 11th and the 19th.

PCM 9: Time, Distance, and Rate

1. a. time
   b. $t = \frac{d}{r}$
   c. $\frac{385}{55} = 7$ hours
2. a. rate
   b. $r = \frac{d}{t}$
   c. $\frac{5}{2} = 2\frac{1}{2}$ miles per hour
3. a. distance
   b. $d = rt$
   c. $2\frac{1}{2} \times 200 = 500$ miles
4. Answers will vary.

PCM 12: Thermometers

Celsius

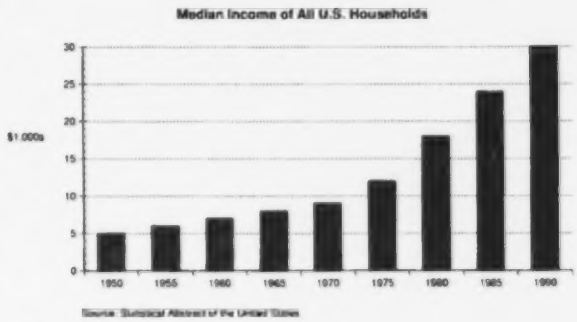
Fahrenheit

PCM 17: Nutrition Table

1. crackers
2. orange juice
3. 4 g
4. 8 g
5. crackers, no, yogurt

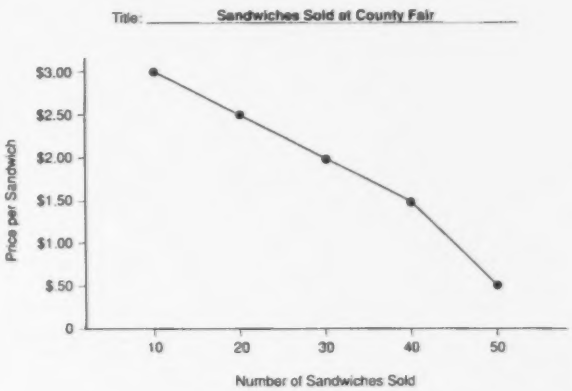
6–8. Answers will vary.

PCM 21: Bar Graphs



PCM 28: Correlations

Graphs will vary, but should show a negative correlation.



1. The graph should show a negative correlation.
2. As the price of the sandwiches decreases, the number of sandwiches sold increases.

PCM 29: Spinner

1. $\frac{3}{8}$
2. $\frac{2}{8} = \frac{1}{4}$
3. $\frac{1}{8}$
4. $\frac{2}{8} = \frac{1}{4}$

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ISBN 1-56420-386-7
9 781564 203861

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